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SEPTEMBER 1939

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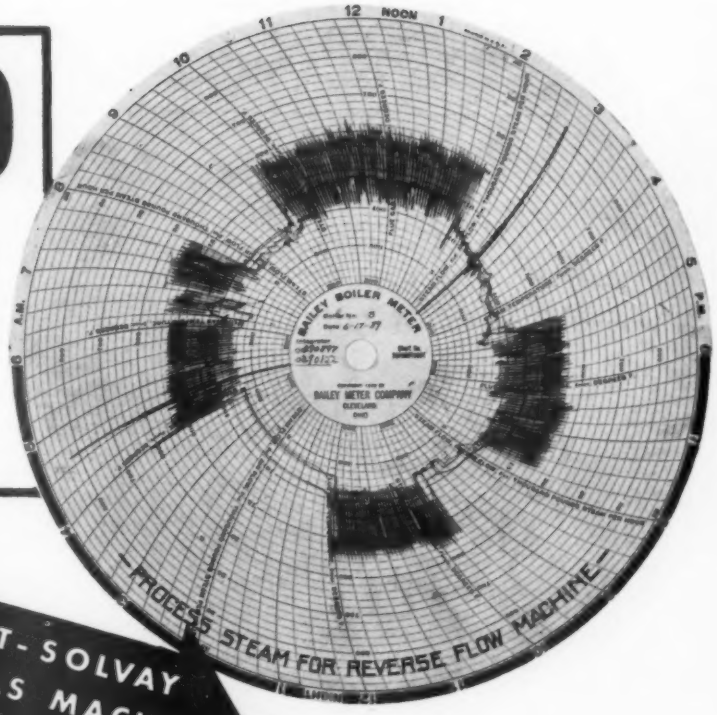

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Oil per M C F, 4.85 gal. Heavy Bunker C	
Tar Removed per M C F*	1.179 gal.

AVERAGES FOR MAY

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*Tar figured at 32% of enriching oil.
**Not pushing machine. Has made as high as 155,000 per hr.

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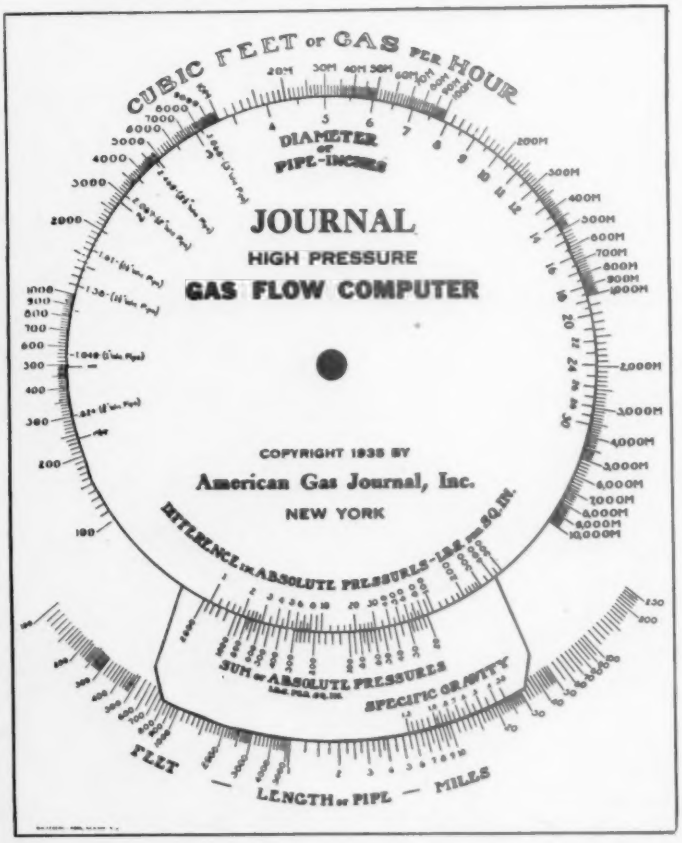

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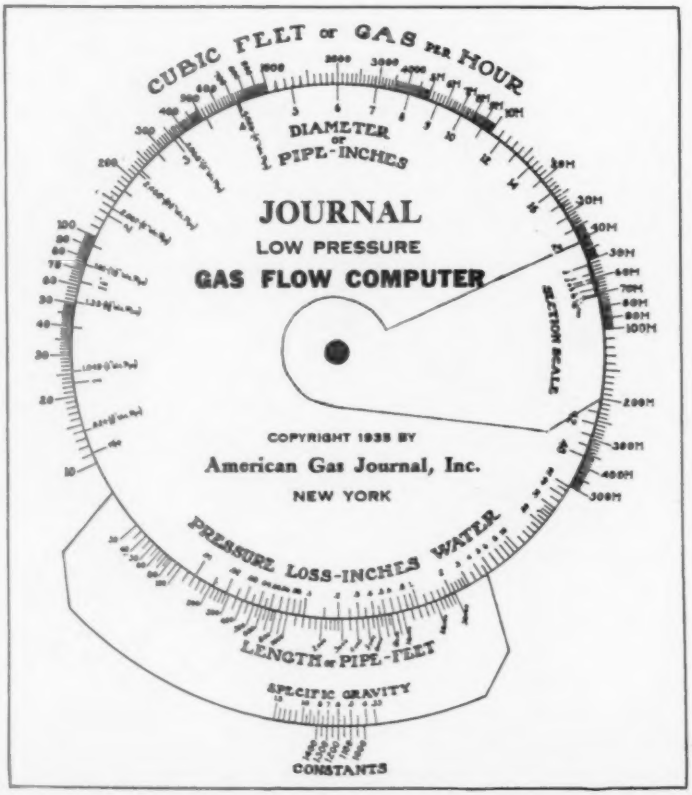

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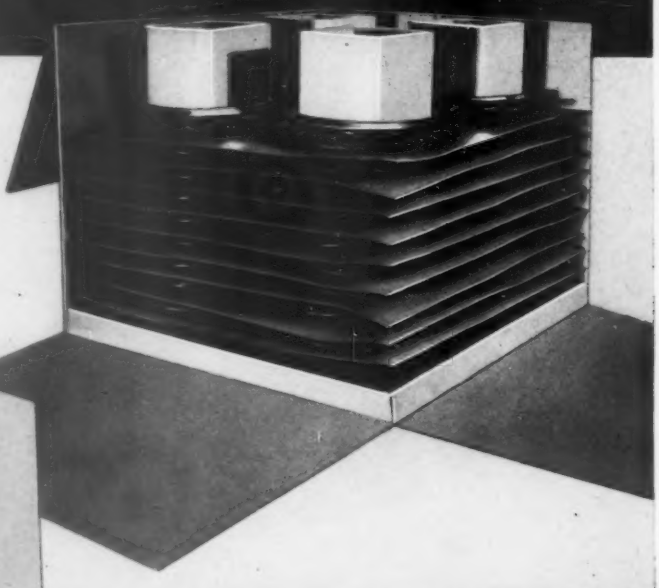

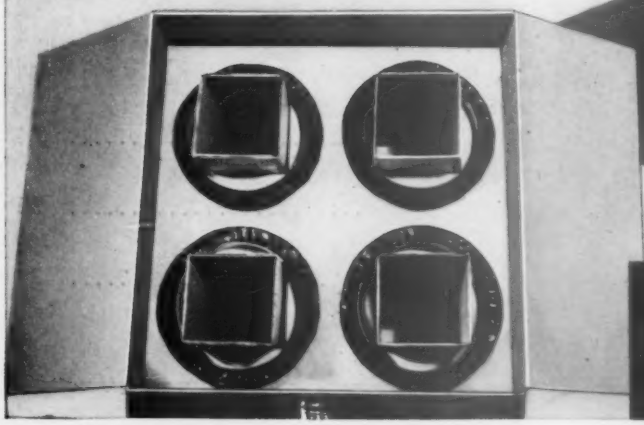

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What Are The Answers To Servicing?

By
R. J. Rutherford
President
The New England Gas Association

R. J. Rutherford

WHAT should we do to check the rising cost of servicing the gas appliances belonging to our customers? This is one of the major problems confronting the gas industry today; and The New England Gas Association has recently set for itself the important task of trying to find a solution for its members.

Few if any other industries give an amount of free service on customer-owned appliances comparable to that furnished by the gas utilities. Our whole industry has been built on the idea of service. In fact, the gas bill has come to be regarded by many as a sort of insurance premium or guarantee of satisfactory cooking, water heating, refrigeration or house heating regardless of whether the customer's appliances are modern, well built and cared for or are neglected, ancient and of inferior design and construction.

In recent years, free servicing of customers' appliances has become an increasingly serious item of expense to gas companies. In some places, it has more than doubled. Certain investigations have showed that 20% to 25% of the customers receive 75% to 80% of the service calls. The first question is: "Why?" The second is: "What shall we do about it?"

This matter of appliance servicing costs has been under observation in New England for some time past. Here are a few of the things that have been found. One study showed that

20% of the customers require 80% of the service calls,

75% of the calls are on appliances not sold by the gas company,

78% of the calls are on combination, gas-end and obsolete ranges.

In another place, 25% of the customers were responsible for 75% of the service calls; and 75% of the appliances involved were either old or else of inferior design and construction, and not sold or approved by the company.

The thought of a servicing study, with especial reference to the training of service men, was first discussed by the Association's Sales Development Committee in May of 1938. Because of the press of other activities then, the discussions remained in a tentative stage, although several conferences were held in the summer and fall of 1938 covering the needs and possibilties involved.

This matter was again brought up —this time before a meeting of the Operating Division of the Association on January 20, 1939, by Mr. Hall M. Henry in a paper, "Some Reflections on Service." He said in part:

"I would like to propose that our New England Gas Association set up a committee to formulate possible research studies and projects to reduce gas service complaints and that various phases of the problem be assigned to different companies for field investigation and analysis. I believe that such a committee's recommendations, followed by actual field work, could materially assist in a proper solution of this important problem.

"In the matter of servicing due to our gas, I have tried to emphasize the need for better control over our gas quality — the desirability of studying the most economical method of reducing gas service costs — and have recommended that a committee be appointed to draw up (a) suggested methods of reducing service costs caused by poor gas quality and

(b) procedure for field testing.

"On appliance servicing, I have suggested the manufacturers be requested to add a sum to cover servicing during guarantee period—and that a charge be made for servicing beyond the guarantee period—and have pointed out what has been done along these lines. I have also suggested that a committee of utility men meet with the manufacturers' committee to study and report on these ideas."

At a meeting of the Board of Directors of the Association on February 15, 1939, it was voted "that the President be authorized to appoint such Association committees as he may deem desirable in order to undertake a comprehensive survey of and research into the general servicing question." The directors expressed great interest in this project and a concerted belief in its potential value to their own companies, among others.

It has been pointed out that there are almost necessarily three major aspects to this problem:

First, the *factual* aspect.

Second, the *technical* aspect.

Third, the *interpretive* aspect.

The *factual aspect* concerns the determination of the problem, the factors affecting it and the obtaining of those facts necessary to properly formulate a solution.

The *technical aspect* concerns the three main internal methods available to the industry of reducing servicing expense, namely:

1. Increasing efficiency or the quality of the Servicing Department personnel.
2. Improving the quality of the product.
3. Improving the quality of the utilization equipment.

The *interpretive aspect* concerns the policy and both the public and industry relations angles of the problem.

To study and report on these various aspects of the servicing problem five committees have been appointed: An Accounting Servicing Committee, a Contact and Job Training Committee, a Gas Conditioning Committee, an Equipment Design and Standardization Committee and a Servicing Policy Committee.

The *factual aspect* will be covered largely by the Accounting Committee, (Mr. H. L. Dalbeck of Cambridge, Chairman).

Its objectives comprise:

(1) The recommendation of a definite service accounting procedure which all New England companies can use.

(2) The setting up of accounting records to facilitate comparable comparisons between companies regarding servicing costs.

(3) The collection of pertinent data covering service costs, causes of service trouble, the makes of appliances involved, whether sold by company or dealer, etc.

(4) A study of pertinent A. G. A. classification committee recommendations.

The Contact and Job Training Committee, the Gas Conditioning Committee and the Equipment Design and Standardization Committee will handle the *technical aspects.*

The Contact and Job Training Committee (Mr. J. L. Johnson of Providence, Chairman) will do the following:

(1) Study the extensive material which has been tentatively prepared by the Worcester company during the past year.

(2) Prepare a manual which might include part or all of this material and perhaps certain additional material, which manual primarily will be used for technical training of service personnel but also will be of value to the member companies in clarifying, simplifying and standardizing service policies and procedures.

The Gas Conditioning Committee (Mr. D. S. Reynolds of Boston, Chairman) plans:

(1) A review of the pertinent research work which has been done in the committee's field.

(2) A recommendation of tests which might be run to determine the value of various methods.

(3) The supervision of the conduct of such tests.

The Equipment Design and Standardization Committee (Mr. E. H. Eacker of Boston, Chairman) will seek:

(1) To ascertain design factors that cause service troubles.

(2) To recommend desirable changes in the light of the foregoing study.

(3) To ascertain the special appliance "gadget" requirements of the New England companies and the reasons therefore.

(4) To recommend desirable simplifications and standardizations in the light of the foregoing study.

The Servicing Policy Committee (Mr. R. J. Rutherford of Worcester, Chairman) will handle the *interpretive aspect.* It is charged with the administration of the entire project. The four research committees mentioned will report to this Committee, and it in turn will report to the Association directors. The Association President is chairman of this committee.

In addition to exercising general supervision over the servicing project, the Policy Committee will give direct consideration, among other things, to:

(1) Cooperation between the gas companies and the gas appliance manufacturers with respect to certain service matters.

(2) Suggest possible policies as to charging for service or not, guarantee periods, etc.

(3) Should the home service department report to the service department or to the sales department?

The reaction of the Committee members serving in connection with this project has been one of great interest. Committee meetings thus far have had a very large attendance —nearly 100% in every case. The New England Gas Association has received letters from a number of its members indicating the importance which is attached to the work now under way and offering extensive cooperation.

It is anticipated that the work on the Servicing Project will require several years for completion. In fact, it has been suggested that it may be desirable to continue certain phases of it for an indefinite period. The aim is to proceed slowly and carefully and to achieve practical results.

Since the project is just now emerging from its organization stage, some details have not yet been worked out.

The program of the Contact and Job Training Committee will be conducted in cooperation with a faculty member representing one of the leading educational institutions in the area, just as the work of the Sales Development Committee (salesman's textbook and other sales material) was carried on in active cooperation with the Bureau of Business Research, Boston University College of Business Administration. The Association directors have just underwritten $2,500 towards the cooperative preparation of a service manual to feature technical material, company policies and human relations. This manual will constitute the basis for company classes and should be available by next spring.

Comprehensive questionnaires recently sent to the New England companies have already been answered by over 60% of this area's meters and will provide considerable valuable working data for the Equipment Design and Standardization and the Accounting Servicing Committees.

The Tools of the Industrial Gas Engineer

by
Raymond F. Mann
Wentz-Mann Company
Kenmore, N. Y.

IN a literal sense the working tools of the industrial gas engineer are little more than pencil and paper, a slide rule, and a drawing board. With these he draws up his proposals for the prospect and his detailed sketches for the shop or erector.

In a figurative sense, however, he makes use of a full kit of tools, assembled usually piece by piece, as his experience and knowledge develop. In this kit will be found catalogues and books of reference, well buttressed by personal notebooks in which are kept ready to hand tables and graphs on a multitude of subjects. There will be data on the flow of gas, steam, water, and air through pipes and orifices, combustion charts, gas analyses, meter and regulator capacities, specific heats and gravities, heat losses through furnace walls, pertinent data on furnace design, construction costs, and unit gas consumptions on various industrial uses, and a hundred and one other bits of engineering knowledge.

This information the engineer collects from handbooks, technical publications, magazine articles, catalogues, trade papers, plant tests, laboratory experiments, committee assignments, etc. Its amount and scope are limited only by the range of his interests, which with the typical engineer are extremely wide. As in a previous article on the selling of industrial gas, we wish to emphasize the value of manufacturers' catalogues. In addition to the descriptive matter on their individual specialties, many of them contain very good material on combustion and the many engineering aspects of the gas business. The entered apprentice in the industrial department, be his interest mainly engineering or mainly sales, should start to collect catalogues as his very first act.

Considering handbooks, he will want to own the "Gas Engineers' Handbook," prepared by the Pacific Coast Gas Association and published by McGraw-Hill Book Company. Its 900-odd pages cover a multitude of pertinent subjects in a handy, readily located fashion. He will also want a copy of Marks or Kents, which contains information on all branches of engineering. He should have access to the Chemical Rubber Company's "Handbook of Chemistry & Physics," the "Metals Handbook" of the American Society for Metals, the Guide of the American Society of Heating & Ventilating Engineers, and a Carnegie (U. S. Steel Pocket Companion) or Bethlehem handbook. The book entitled "Fan Engineering" published by the Buffalo Forge Company will often come in handy. Both volumes of Professor Morgan's "Textbook of American Gas Practise" are especially worthwhile, giving practically the only modern description of gas manufacture and distribution. The American Gas Journal's "Catalog and Handbook" has many valuable tables. As the industrial engineer gets into furnace design he will read and consult the volumes on that subject by Professors Trinks and Mawhinney. He should take care, however, to get only the latest editions and to realize as he reads that advances are made in the art faster than new editions of books are published. Much that appears between book covers on furnace design, although up-to-date yesterday, may be obsolete today.

The booklets of the American Gas Association on industrial gas subjects are a very necessary part of his library. Foremost of all will be the one entitled "Combustion," a very fine handling of that basic subject. Other booklets such as those on "Steam Boilers," "Water Heating," "Food Products," and "Bakeries, Hotels, and Restaurants," although in some cases containing much that has become obsolete, all have a great deal to recommend them. The same applies to the Industrial Service Letters of the Industrial Gas Section of the A.G.A. The best practise at the time of their printing is given, although refinements and improvements rapidly modify their recommendations. To keep abreast of the latest developments one must read trade journals and committee reports, attend conventions, and keep in touch with one's fellows. We have already paid tribute to the part that the manufacturers' representatives play in the dissemination of such knowledge. Their travels and contacts with many industrial departments give them a many-sided view of what is going on and a splendid overall picture.

We assume, of course, that the industrial man will widen his horizon as far as possible by attending conventions and accepting committee assignments. Such work will always give him back more than he has to give. The world does move, and sooner or later a way is discovered to improve most any heating process or equipment. The immersion burner, the radiant tube, insulating firebrick and prepared atmospheres are but a few of the more recent develments that have virtually revolutionized the field of industrial gas. The entire art of industrial gas engineering is so new and advancing so rapidly that its disciples must be ever alert and quick to grasp the advantages of new processes and improved equipment. There is no resting on one's oars.

In most gas companies the industrial gas engineer must be so equipped that he can engineer all details connected with the installation of gas in a plant. This means he must be able to determine the size of line for the main extension, if one is needed, the size of the service pipe, the number and capacities of gas meters and regulators, and the size and location of the house line. He must also be able to estimate the cost of such items, and the time required to install them. Frequently he must supervise work done by the consumer in the running of piping or the construction of furnaces. Furthermore, he must be familiar with and able to use intelligently such equipment as thermocouples, optical pyrometers, combustible gas indicators and gas analyzing equipment, such as the Orsat or the Burrell. He must have a working knowledge of the characteristics of fans, compressors and pumps. He must be able to advise on temperature control systems. Fortunately in many cases he has the aid of the manufacturer's agent on the more complicated of such equipment. However, that does not

excuse him from the responsibility of advising the consumer properly; and advice can only be based on knowledge.

In previous articles we have included some of the data mentioned above as essential for the files of the industrial engineer. Below we give several more tables of accepted usage, and a few condensations for simplicity.

1. The Flow of Gas Through Pipe Lines

Taking up first the question of the flow of gas through pipe lines, we find some disagreement among the authorities with several different formulas in vogue. A common practise, however, seems to be to use the Weymouth formula for high pressure transmission and the Spitzglass formula for low pressure lines. Proceeding in that order, we have:—

A. High Pressure Transmission of Gas

The Weymouth formula, assuming a temperature of 60° F. and an atmospheric pressure of 30″ of mercury reduces to:—

$$Q = 27.95 \sqrt{\frac{(P_1^2 - P_2^2)\ d^{16/3}}{GL}}$$

where Q = flow of gas in cubic feet an hour.
P_1 = initial pressure in lbs./sq. inch *absolute*.
P_2 = final pressure in lbs./sq. inch *absolute*.
d = actual internal diameter of pipe in inches.
G = specific gravity of gas.
L = length of pipe in *miles*.

In this formula, note that the pressures are in pounds per square inch absolute, which is gauge pressure *plus* 14.73 (at sea level). Actual pipe diameters, not nominal sizes, are necessary. The length of the line is in miles. Tables are available (Gas Engineers' Handbook, page 735 or American Gas Catalog and Handbook, page 113) giving the values of $d^{16/3}$ or $d^{8/3}$ (the same as $\sqrt{d^{16/3}}$) for pipes 2″ and up.

As the specific gravity will usually be a constant for the gas within each engineer's particular jurisdiction, the formula can be still further reduced to meet such local conditions. Thus the writer who dealt with a natural gas of .6 gravity, set up for his own use the following:—

2″ pipe	$Q = 249 \sqrt{\frac{P_1^2 - P_2^2}{L}}$	or	$18{,}100 \sqrt{\frac{P_1^2 - P_2^2}{l}}$	
3″ "	717	"	52,200	"
4″ "	1480	"	107,600	"
6″ "	4370	"	318,000	"
8″ "	9460	"	689,000	"

where L = length of pipe in miles
and l = length of pipe in feet.

B. Low Pressure Transmission of Gas

The Spitzglass formula covering the flow of low pressure gas (distribution systems under a 2 pounds pressure) is:—

$$Q = 3550 \sqrt{\frac{h\ d^5}{\frac{G\,l\,(1. + 3.6 + 0.03\,d)}{d}}}$$

where Q = flow of gas in cubic feet an hour.
h = pressure drop in inches of water.
G = specific gravity of gas.
l = length of pipe in feet.
d = diameter of pipe.

This formula is more often used in the form given by Pole, namely:—

$$Q = 1350 \sqrt{\frac{hd^5}{Gl}}$$

where l = length of pipe in yards.

While this gives values reasonably accurate for pipe sizes 4″ and over, the constant should be less than 1350 for smaller sizes. The American Gas Catalog and Handbook suggests (page 113) the following:—

¾-1″ pipe	1,000
1¼-1½″ pipe	1,100
2″ pipe	1,200
3″ pipe	1,300
4″ and over	1,350

As the engineer is constantly called upon to figure pipe sizes for low pressure flows or asked for the capacity of existing lines, he saves himself a tremendous amount of time by having in his pocket a gas flow computer of the circular slide rule type. With this, knowing any three factors of the following four, flow per hour. diameter of pipe, length of pipe, and pressure drop, the fourth is found in a few seconds. Such computers are also available for high pressure flows. These computers are accurate, convenient to carry, and great time savers.

For those who prefer data in a tabulated form, there is a table available, based on actual determinations which covers a wide range of pipe sizes, pressure drops, and lengths.* This table is based on a specific gravity of .6. Reference to the flow formulas shows that the rate of flow varies inversely as the square root of the specific gravity, directly as the square root of the pressure drop, and inversely as the square root of the length. Hence we can set up the following correction tables to adjust for different specific gravities or pressure drops:—

* See American Gas Catalog and Handbook, 1938 Edition, page 112.

Conversion Table to Correct Flows for Changes in Specific Gravity of Gas

Specific Gravity	Multiplier
.30	1.415
.35	1.310
.40	1.225
.45	1.155
.50	1.095
.55	1.045
.60	1.000
.65	.961
.70	.926
.75	.894
.80	.866
.85	.841
.90	.817
1.00	775

Conversion Table to Correct Flows for Different Pressure Drops

Pressure Drop	Multiplier
1.0″ water	1.00
1.5	1.22
2.0	1.41
2.5	1.58
3.0	1.73
3.5	1.87
4.0	2.00

In the use of any of the formulas given, the length of the pipe represents the distance in a straight line; and an allowance has to be made for any elbows, angles, valves or other fittings, since these introduce a pressure drop through friction that reduces the flow of gas. The usual method of making this allowance is to express the fitting as so much equivalent length of pipe of the diameter in question. While empirical formulas for determining the correct amount exist, they are rather complicated; and usually the resistance of the fittings is but a minor part of the total pipe resistance. The accompanying table is given in American Gas Catalog and Handbook, 1938 edition, page 111.

2. The Flow of Air Thru Pipe Lines

The flow of air of course follows the same laws as those given above for the flow of gas. Our problems are entirely different, however, as distances are limited and pressures usually low. Only in the layout of duct work for fan air, a problem in air heater work, do we usually do much engineering. The standard chart given herewith covers our needs. This same chart is used in air conditioning work and is found in any handbook on that subject.

3. The Flow of Steam Thru Pipes

The flow of steam through pipe line is usually calculated from the empirical formula of Babcock. This

RESISTANCE OF PIPE FITTINGS TO FLOW
EQUIVALENT FEET OF STRAIGHT PIPE

Steam—Air—Gas

Nominal pipe size inches	Actual inside diameter inches	Gate Valve	Long radius ell or on run of standard tee	Medium radius ell or on run of tee reduced in size 25 per cent.	Standard ell or on run of tee reduced in size 50 per cent.	Angle Valve	Close return bend	Tee through side outlet	Globe Valve
Resistance factor for type of fitting		0.25	0.33	0.43	0.67	0.90	1.50	1.33	2.00
½	0.622	0.31	0.41	0.53	0.84	1.1	1.9	1.7	2.5
¾	0.824	0.44	0.57	0.73	1.3	1.6	1.5	2.3	3.5
1	1.048	0.57	0.77	0.98	1.6	2.1	2.3	3.1	4.7
1¼	1.380	0.82	1.1	1.4	2.3	2.9	3.3	4.4	6.5
1½	1.610	0.98	1.3	1.6	2.6	3.5	3.9	5.3	7.8
2	2.067	1.3	1.7	2.3	3.6	4.8	5.3	7.1	10.6
2½	2.469	1.6	2.3	2.8	4.4	5.9	6.6	8.7	13.1
3	3.068	2.1	2.8	3.6	5.7	7.7	8.5	11.4	17.1
4	4.026	3.0	3.9	5.0	7.8	10.7	11.8	15.8	23.7
5	5.047	3.9	5.1	6.5	10.4	13.9	15.5	20.7	31.0
6	6.065	4.8	6.4	8.1	12.9	17.4	19.3	25.6	38.6
8	7.981	6.7	8.9	11.3	17.9	24.1	26.8	35.6	53.8
10	10.020	8.8	11.6	14.7	23.4	31.3	35.0	46.6	70.0
12	12.000	10.9	14.4	18.4	29.3	39.3	43.7	58.1	87.4

Based on Foster's formula $L = 43.7\ r.\ d^{1.2}$
in which L = equivalent length straight pipe in feet
r = resistance factor
d = diameter of fitting in feet
(A. S. M. E. Trans., Vol 42, pg. 648, 1920)

can be expressed in two forms as follows:—

$$P = 0.000131\left(\frac{d + 3.6}{d^5}\right)\frac{W^2 L}{D}$$

$$\text{or } W = 5220\sqrt{\frac{P\ D\ d^5}{L\ (1 + \frac{3.6}{d})}}$$

where P = pressure loss, pounds per square inch.
d = internal diameter of pipe in inches.
W = weight of steam flow per hour in pounds.
L = length of pipe in feet.
D = weight of 1 cubic foot of steam at the inlet pressure.

Again laborious calculations can be saved by using tabulated data or by the accompanying nomographic chart published in the Heating & Ventilating Magazine.

4. The Flow of Water Thru Pipes

The equation of Hazen and William gives the flow of water through pipes as follows:—

$$Q = 0.442\ cd^{2.63}\left(\frac{P}{l}\right)^{0.54}$$

where Q = flow of water in gallons per minute.
c = coefficient of roughness.
140 for new steel pipe.
130 for new cast iron.
110 for riveted pipe.
d = diameter of pipe in inches.
P = pressure drop in pounds per square inch.
l = length of pipe in feet.

Reference to tabulated data such as given on pages 578-581 of the Gas Engineers' Handbook is advised as against solving this equation.

5. The Flow of Gas Thru Orifices

Data on the flow of gas through orifices is extremely important in all work on atmospheric burners as well as on high pressure gas burners. The basic formula is:—

$$Q = 1658.5\ AK\sqrt{\frac{H}{G}}$$

where Q = the flow of gas in cubic feet per hour.
A = the area of the orifice in square inches.
K = the discharge coefficient of the orifice.
H = the gas pressure in inches of water.
G = the specific gravity of the gas.

The discharge coefficient K depends on the design of the particular orifice in question, and runs all the way from .6 to .9. A value of .78 is a good practical average. If this

FLOW OF AIR

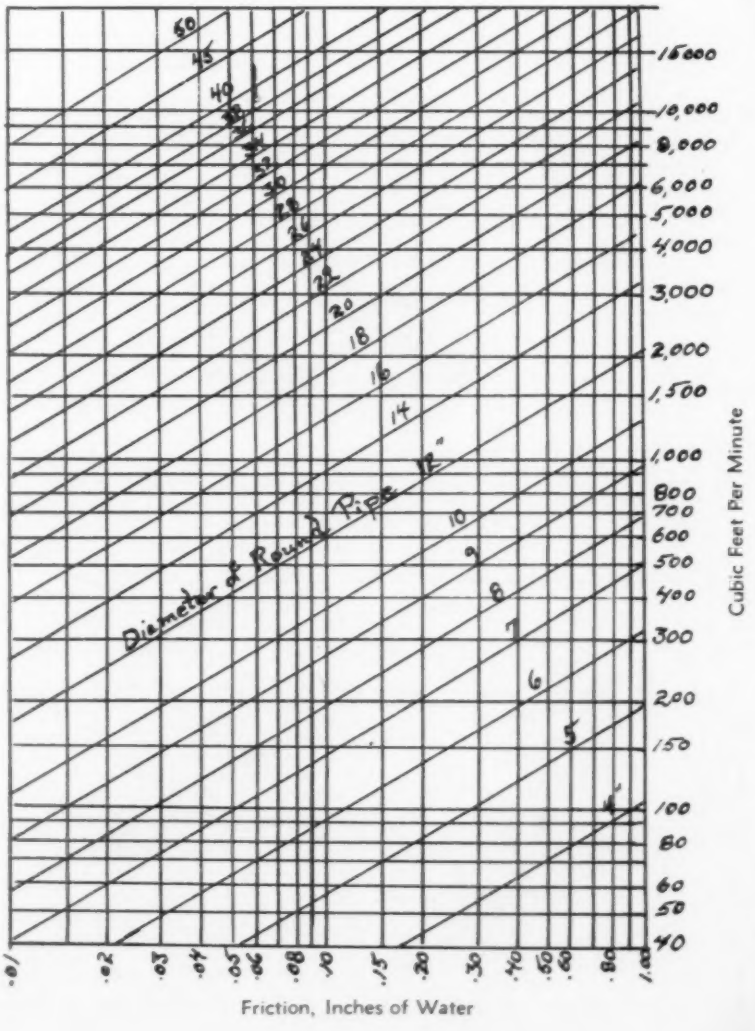


figure is substituted in the above formula, it reduces to:—

$$Q = 1300\,A\sqrt{\frac{H}{G}}$$

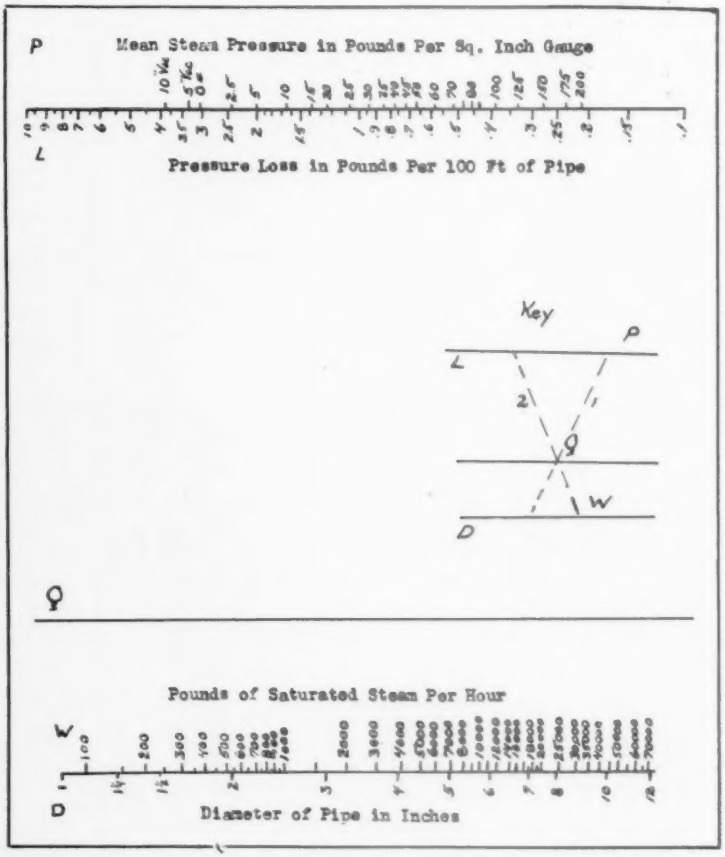
This can be still further simplified to fit local conditions by inserting the values for specific gravity and the usual pressure that would be found at the orifice. Thus, with a mixed gas of .55 gravity and a normal pressure of 6″ of water, the equation becomes:—

$$Q = 4300\,A$$

a figure that can easily be memorized.

An exceptionally good set of charts on orifice capacities is given in the A.G.A. booklet "Combustion," while many of the manufacturers give tabulated data on this subject in their catalogs. The engineer should bear in mind at all times that there is a variable factor, the K of the equation, that changes with each change in orifice shape; and hence there will be some variation between actual and calculated flow.

FLOW OF STEAM IN PIPE LINES



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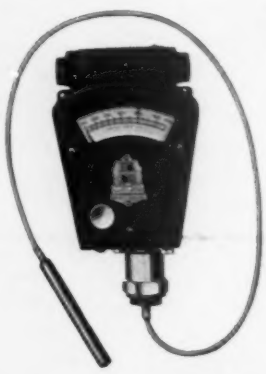
Published by *Heating & Ventilation.*

Combustion Charts

It goes without saying that the industrial engineer should have complete data regarding the composition and combustion of the product he sells. He should know the analysis of the gas as distributed, its percentage of sulphur and other impurities, its vapor pressure or water content, the products of combustion, the dew point, theoretical flame temperature, rate of flame propagation, and limits of inflammability. For a typical manufactured or natural gas much of this information will be found in handbooks on combustion. It is suggested, however, that the engineer take a representative analysis of the local gas and make up a combustion chart such as given herewith. From this he can draw up several pertinent graphs similar to those given in the May 1938 article where the practical application of such knowledge was pointed out. These graphs were "Heat in Flue Products for Various CO_2 Analyses," "Available Heat Chart for a 900 Btu Mixed Gas," and "Excess Air as Given by Flue Gas Analysis." Detailed information on the derivation of the data is given in the A.G.A. booklet "Combustion."

These charts give the answer to many common questions that the engineer will meet. Take for instance this one:—How much water is formed on the combustion of 1,000 cubic feet of the above mentioned 900 Btu gas? The table shows it would be 1,871 cubic feet, which is equivalent to 89 pounds or 10.7 gallons. Another common inquiry is the amount of air necessary to burn a cubic foot of gas. Again we read the answer directly as 8.411 cubic feet. Quite often the question arises as to the difference between the gross



Partlow Model M Temperature Control

Three ranges: 50 to 350; 100 to 650, and 100 to 1000 Deg. Fahr.
Switch capacity to 500 watts ac., 50 watts dc.

This Model M Electric Temperature control is used to operate a solenoid or motor valve in a gas, oil or steam line and thus regulate flow in step with heat requirements. It is employed to control the operation of electric heating elements, relays, or motors.

It automatically maintains temperature (where you set the red-colored pointer on its temperature-indicating scale) in an oven, melting pot, platen, drier or any heated equipment.

This electric control is available in two and three-wire designs for ac. and dc. control circuits. The thermostatic element is our mercury-actuated flexible unit, powerful, positive and accurate. All elements are interchangeable. List prices of the complete control range from $55 to $62.

Write for Bulletin 505-C for detail information.

The Partlow Corporation
2 Champion Road, New Hartford, New York

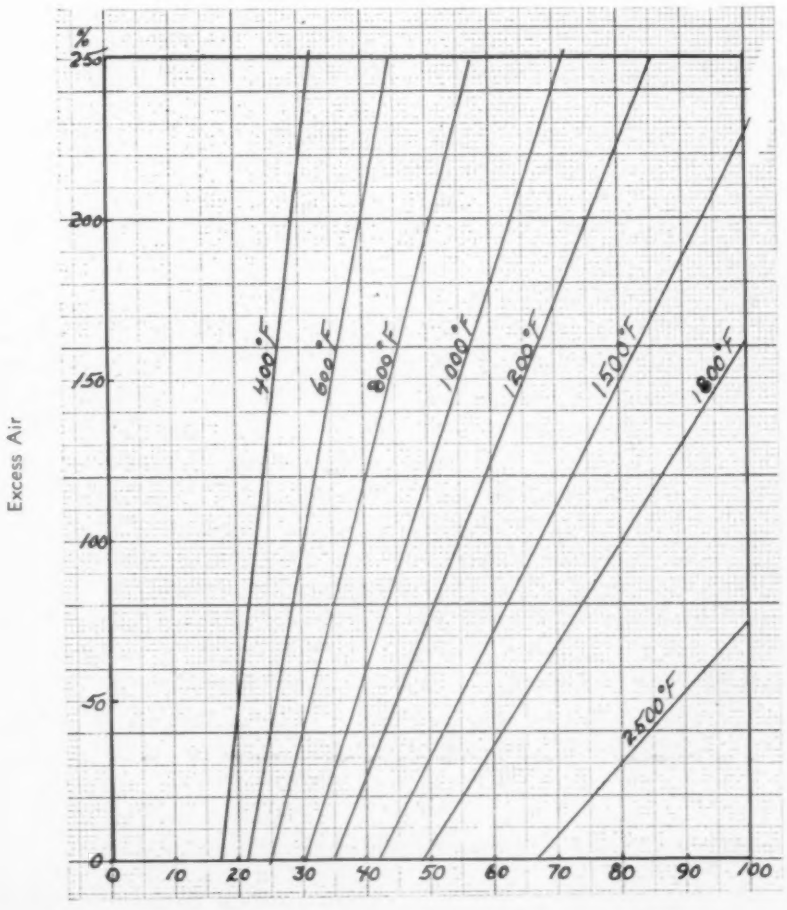
	Mixture Before Combustion			*Cu. Ft. Products of Combustion*				*Gross B.t.u. 60-30 Dry*	*Net B.t.u. 60-30 Dry*
	Cu. Ft. of Gas	*O_2 Req'd*	*Air & H_2O*	*H_2O*	*CO_2*	*N_2*	*Total*		
CH_4	.662	1.324	....	1.324	.662	....	1.986	671.73	604.94
C_2H_6	.086	.301	....	.258	.172	....	.430	153.17	140.27
H_2	.154	.077	....	.154	...	....	.154	49.81	42.36
CO	.023	.0115	....	....	.023	....	.023	7.44	7.44
C_2H_4	.011	.039	....	.022	.022	....	.044	17.94	16.83
C_6H_6	.002	.015	....	.006	.012	....	.018	7.48	7.18
CO_2	.002	....	....	....	.002	....	.002	.....	.....
N_2	.058	....	....	....	...	.058	.058	.....	.....
O_2	.002	—.002	....	....	...	....	....	.....	.....
Dry Air	....	....	8.411	....	...	6.646	6.646	.....	.....
H_2O (Air and gas)	....	....	.107	.107	...	....	.107	.....	.....
	1.000	1.7655	....	1.871	.893	6.704	9.468	907.6	819.0
							—1.871		
							Dry Volume 7.597		

% volume H_2O in flue products..... 19.8%
Theoretical Dew Foint ..... 140.5° F.
Flue Gas Volume (dry) ..... $\frac{.893 \times 100}{\%CO_2 \text{ (analysis)}}$

Ultimate $CO_2 = \frac{.893}{7.597} = 11.75\%$

and net or high and low heating values. For this 900 Btu gas the difference is 88.6 Btu or some 9.8% of the gross. Thus, unless the products of combustion are cooled in the furnace below the dew point, the furnace efficiency can not possibly exceed 90.2%. *(Since flue gas temperatures must be above the temperature of the work there is a loss in sensible heat as well and a combustion efficiency of 86% obtainable in the better domestic, gas designed heating boilers is about the practical limit).*

HEAT LOSS IN FLUE GASES FOR A 900 BTU. MIXED GAS WITH VARIOUS EXCESS AIR



The dew point is sometimes an important consideration as it affects the problem of condensation. This is calculated from the percentage of water in the products of combustion; and for this gas is theoretically 140.5° F. The theoretical flame temperature means little, merely fixing an upper limit of what is possible with gas combustion. The rate of flame propagation is a very important consideration, explaining the difference in behavior of burners on manufactured and natural gas. The much faster burning manufactured gas calls for a different treatment in burner design than the slower burning natural gas. The former tends to backfire, the latter to blow away from the burner ports. A cubic foot of combustible gas and air at the correct air-gas ratio has practically the same Btu content with either gas; but the port area should be larger for the natural gas burner. The actual flame velocity varies with the air-gas ratio, reaching a maximum at the correct ratio for perfect combustion. For the gas we have been discussing, this maximum speed is approximately 1.15 feet per second. Coal gas will have double this rate, and water gas a similar high velocity.

The limits of inflammability are needed for several reasons. A mixture with too much or too little gas in air will not burn. In cases of explosions where gas may be involved this knowledge is often of value in eliminating gas or tracing down contributing factors. In dealing with prepared gases for furnishing certain furnace atmospheres, it is often desirable to generate an inert gas. Some combustion systems mix part of the

(Continued on page 44)

The Certification of Gas Appliances

Requirements and Practice Employed in Australia

By
James Harrison
Deputy President and Secretary
The National Gas Association
of Australia

ANY scheme which aims at the general improvement of gas appliances is inevitably a matter of importance. Although the standard of gas appliances in England appears to be relatively high, the fact that the question of their certification is raised there, from time to time, would appear to indicate that there exists some need for such a scheme.

It might, therefore, be of some interest to your readers to obtain some idea of the scheme instituted several years ago and conducted by The National Gas Association of Australia.

As this scheme differs in some important aspects from those in operation in other parts of the world, this information may, perhaps, have an added interest.

The need for the scheme rests on the following fundamental propositions:

1. That the purchaser of a gas appliance is entitled to know that it is safe, efficient and of durable construction.
2. That gas undertakings should be in a position to know readily what appliances are reliable, just as the hallmark easily distinguishes gold and silver from dross.
3. That, as gas appliances stand between ourselves and our consumers, the progressive welfare of our industry must always be inseparably bound up in them. It is reasonable, therefore, that the Gas Industry should have some instrument of control in respect of gas appliances.

The need for a scheme is, of course, commensurate with the standard which manufacturers of appliances maintain. In Australia, prior to the existence of the scheme, there were many manufacturers earnestly striving to reach high standards but who had not the requisite technical knowledge to attain them. By giving them cheap and ready access to the laboratories of the Association and their staffs they, in effect, have had attached to their organizations the whole of the resources of the gas industry.

The Compilation of Standard Requirements

Draft minimum standard requirements are created by a committee specially appointed for the purpose. These are sent for comment to all gas undertakings in Australia and New Zealand as well as to appliance manufacturers. The comments received are considered by the committee. Final Standard Requirements are then issued, published and distributed.

Testing and Examining Appliances for Compliance with Standard Requirements, Durability of Construction and Easy Servicing.

After Standard Requirements have been issued, manufacturers send appropriate appliances to one of the Association's laboratories for examination and test.

The first process is to have them examined for durability of construction. Specifications of materials are not included in Standard Requirements because of the obvious difficulties involved.

The appliance is then examined by fitters and men with servicing and maintenance experience who make suggestions in design, etc. having regard to the ready accessibility of parts, etc. with resultant ease and cheapness of service and maintenance.

When the suggested constructional alterations have been made, the appliance is submitted to laboratory tests for compliance with the appropriate Standard Requirements.

If the appliance pass, the manufacturer is given a Certificate of Approval which entitles him to have reproductions of the appliance badged by an inspector of the Association after the inspector has submitted it to an actual service test and found it to be satisfactory.

If the appliance does not pass, the manufacturer is given every assistance to bring it up to the Association's requirements.

Manufacturers are not permitted to affix badges which are in the sole charge of inspectors.

What the Badge Implies

It will be seen that the Badge of Approval implies compliance with standard requirements, that it is durably constructed, that it is designed to ensure ease of servicing and maintenance and that it has passed an actual service test.

Prices Charged for Laboratory Assistance and Badges of Approval.

Manufacturers are members of this Association. They pay an annual fee of £5 plus £5 for each appliance section to which they are attached. Thus, if a manufacturer belonged to the gas water heater section, he would pay an annual fee of £10. For this he is entitled to access to the laboratories of the Association and may avail himself of the services of the whole technical staffs.

In addition to the annual subscription, manufacturers are charged one shilling for each Badge of Approval affixed.

The Badge of Approval

It was felt that the design of the badge should be simple and readily recognizable by the general public. An attempt has been made to embody these essentials in the design which is reproduced below.

It is also symbolic—the shield being an emblem of protection. The stars represent the "Southern Cross" and refer to the geographical location of the scheme's field of operation.

Badges are of the domed metal or flat transfer type and may be

obtained in colors which will match the color of the appliance.

I have noted with interest some of the objections to appliance certification raised, from time to time, by representatives of the Gas Industry in England and would like with due deference to express my views thereon. Many of these views have been dictated by practical experience. These objections are as follows:

1. That it might prejudice progress.

Our Standard Requirements are not static. Desirable improvements are embodied, from time to time, as competition and progress dictate.

Certificates of Approval are only valid for 12 months and are not renewed unless and until the improvements are embodied in the appliance.

In this way, Standard Requirements becomes an instrument of progressive development.

It is hard to imagine such a procedure as being prejudicial to progress. On the other hand, it is easy to imagine the tardiness of progress if development were left to manufacturers many of whom might have no interest other than cheap construction and aesthetic appeal.

2. That it might cause design to work down to a minimum limit and that a Badge of Approval might tend to convey to the public that all badged appliances were of equal merit.

This is tantamount to saying that the better appearance of an appliance has no appeal value. Thomas Carlyle tells us that it is not our logical mensurative faculty, but our imaginative one, which is king over us. This is another way of saying that people are controlled, not by their reason, but by their sentiment. Hence, it is that the aesthetic appeal is such an important factor in selling anything. It is this which will always prevent any possibility of "design working down to a minimum" or any suggestion that "all badged appliances are of equal merit."

Badges of Approval do not, of themselves, sell appliances—they are merely a crowning feature that is only referred to when elegance and general appeal have done most of the selling job. It is then that the Badge comes along and says, in effect to a potential purchaser, "You have preferred this appliance; that it will give satisfactory service is indicated by this Badge of Approval."

I am of the opinion that the objection raised arises from a wrong point of view as is evidenced by our experience in Australia where it has never materialized.

3. That reliance on certification might diminish the responsibility of gas undertakings to the public.

It does not appear to me material who accepts the responsibility to the public—gas undertakings or an authority constituted on their behalf. If this responsibility were so shifted it would result in its wider acceptance. It is reasonable to assume that some gas undertakings, because of their inability to know what appliances will give good service, have this indifference forced upon them. If they were able to ascertain readily what appliances were desirable they would doubtless prefer them, thus promoting their own interests and those of the Gas Industry.

4. That an official stamp might be accepted by the public as an unqualified guarantee, whilst it could only infer that the appliance bearing it would fulfil the standard when new and properly installed.

The Badge of Approval is an unqualified guarantee of what it implies—safety, efficiency and durable construction of the appliance to which it is affixed.

It is impossible, of course, for a badge to imply that an appliance will never wear out or that it will be properly installed but it does go a long way to insure satisfactory service.

The public is not unreasonable. They know, for instance, that a safety razor is only so when properly used. They know also that they, themselves, will wear out.

Moreover, if a badged appliance be improperly installed, there is less likelihood of an accident because of the general safety provisions prescribed by standard requirements.

5. That the Blue Star of the American Gas Association, representing as it does compliance with minimum standards, has failed to be of any merchandising value for advertising or campaign purposes. Something new, therefore, had to be developed and this led to the "Certified Performance" Range.

The purpose of a badge is not primarily for advertising purposes. Its purpose is set out in the propositions referred to at the beginning of this article.

In desiring to popularize certified ranges, our American friends called the badge another name—Certified Performance. In doing so, they upheld the fundamental principle of certification and proved that they thought it good for advertising purposes.

In introducing the scheme in Australia, no attempt was made to cover the whole field of gas appliances.

A start was made with gas water heaters and gas wash coppers. The scheme is now functioning in respect of gas cookers, whilst standard requirements are in preparation for gas fires, gas space heaters and gas refrigerators. It is the ultimate intention to cover the whole field of domestic gas appliances.

The scheme is operating most successfully which is due, in no small measure, to the earnest cooperation of appliance manufacturers who have testified that the examination of appliances in their factories by an independent inspector has played an important part in improving workmanship with its attendant economies.

In this highly emotional age where novelty and elegance might be promoted at the expense of intrinsic merit, it should be remembered that Gas is on its trial long after these transient charms have cloyed. It is then that its prestige will have little to rest on but the service the appliance can give—a condition which certified appliances can assure.

Vance, Gas Heating Sales Manager for G. E.

S. M. Vance, who has been assistant manager of gas equipment sales, has been appointed sales manager of gas equipment in the heating sales section of the General Electric air conditioning and commercial refrigeration department.

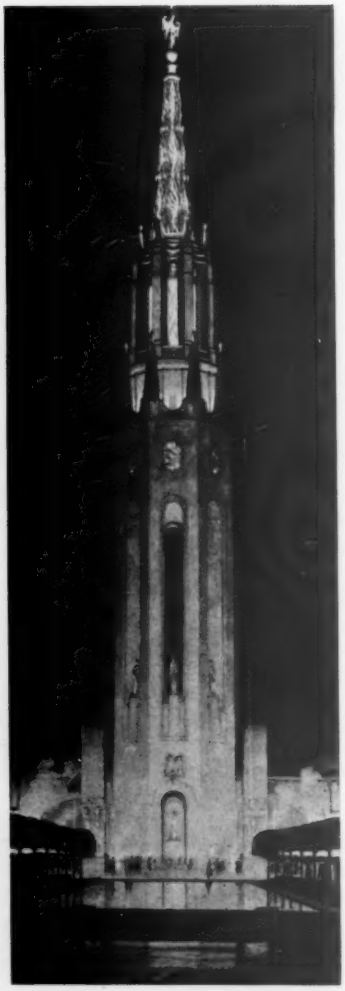
Mr. Vance began his career with the Public Service Co. of Colorado in 1925 as a student engineer, following four years of mechanical engineering at the University of Tennessee.

After a year as cadet engineer, he joined the Surface Combustion Co. as a gas equipment engineer. Later he joined the Republic Light, Heat & Power Co. in Buffalo, N. Y., as industrial gas engineer. In 1930 he moved to Chicago as sales engineer for the Natural Gas Pipeline Co. of America.

In 1935, Mr. Vance became sales manager of gas heating at the Peoples Light Co. in Davenport, Ia. The following year, he returned to Chicago as sales supervisor for the Peoples Gas Light & Coke Co., and joined General Electric in November, 1937.

Mr. Vance will be assisted by C. E. Forest and others in the G. E. offices throughout the country.

Automatic Controls. A 48 page catalog, No. 300, of Mercoid Corporation, 4200 Belmont Ave., Chicago, describes very fully their automatic controls for heating, air conditioning, refrigeration and various industrial applications. Wiring diagrams are included. Copy available on request.



Exposition Central Theme—
TOWER OF THE SUN

San Francisco Fair Uses Gas for Warming Snakes and Up to Firing Locomotives

By
Lucius S. Flint

FROM Sally Rand's Nude Ranch on the Gayway to the dignified California State Buildings on the other end of the island, gas has become the accepted fuel at San Francisco's Golden Gate International Exposition.

The story of gas at the San Francisco Fair is one of engineering achievement, rare showmanship in merchandise display and unique uses ranging from the heating of drinking water for huge pythons in a snake show to the heating of model homes. It's a story of gas stealing the show at a World's Fair.

Not once in a lifetime would gas find so many uses in an area only a mile and a half long and a mile wide as it does at Treasure Island. Not once in a lifetime would it receive so many tests of efficiency.

But before going into those uses, let's examine for a moment the system which provides gas for the island and a few figures on consumption. A gas load of approximately 60,000 cu. ft. per hour is furnished by the Pacific Gas and Electric Co.

From the end of the Key System mole on the Oakland side, where a 5″ x 10″ meter is located, the gas is transported to the island at a pressure of 60 pounds, being carried by a four inch welded line. Where the gas enters the island, its pressure is reduced to 10 pounds by means of a "P" type Regulator.

Pressure is carried at this 10 pound level in the island distribution system. This system consists of 5,000 feet of four inch main, 13,000 feet of two inch main and 1,000 feet of the three inch size. The two inch main is welded and wrapped pipe. In the three and four inch sizes, screwed joints are used. Also included in the distribution system are about two miles of services in sizes ½, ¾, 1¼, 1½ and 2 inches. The services included, there are about six miles of pipe on Treasure Island.

Of the 250 meters on the island, about 16 are high pressure meters with an outlet delivery of 10 pounds. Most of these are located in the California State Buildings where the aggregate consumption runs about 12,000 cu. ft. per hour. Otherwise, regulators at the meters reduce the pressure from 10 pounds to six inches.

The California State Buildings, it is interesting to note use gas entirely for heating, cooking and water heating. Large forced air heaters were installed in each building to maintain constant temperatures. About 75 per cent of the load is used for heating, the balance for the other two items.

Nude Ranch Heated By Gas

As one of the most publicized and best attended attractions at the Fair, Sally Rand's Nude ranch has brought the merits of gas heating very much into the limelight. Even if the audience doesn't require much artificial heat, the girls in the arena do.

Photo, Mike Roberts, Oakland

Sally Rand's Nude Ranch. Temperature in the glass enclosed arena kept at constant temperature with gas heat.

Clad in boots, neckerchiefs, and not too much else, Sally's girls would probably be subject to colds but for some form of dependable heating. Gas does the job. Forced air heaters controlled automatically by thermostats keep the temperature in the glass-enclosed arena constantly at an even level.

Sally's isn't the only girl show on the Gayway using gas heat, although due to the nature of this performance the area heated here by gas is probably larger than anywhere else. However, dressing rooms and other enclosures in most of these shows are gas heated.

Gas Heat For Pythons

It's a far cry from girls to snakes but nevertheless gas heat serves them both. In Cliff Wilson's Bamboo Monster Show, which is also operating at the New York Fair, gas is used exclusively for both heating and water heating.

Strange as it sounds, the temperature in which a snake lives must be

33 ft. Python in front of gas heater at the Monster Show.

kept constant—at right around 76 degrees. Since the Pythons and Boa Constrictors on exhibit here are tremendously valuable, it's only natural that the owners should take every precaution for their health. (One of the pythons, incidentally is said to be the largest in captivity, measuring 31 feet eight inches in length and weighing 603 pounds.)

The windowed enclosure where the big snakes are kept is served by a unit heater equipped with a thermostat. The even temperature thus

Heating water for the snakes at the Monster Show on the Gayway.

maintained not only protects the health of the snakes but also represents insurance against their attempting to harm their attendants—a python becomes active when he gets cold.

The second important use for gas at the monster show is the heating of water for the snakes, and for scrubbing their cage. The cleanest animals in the world, they are just as sensitive to any impurities in water as to sudden changes in temperature. Their surroundings must also be kept sterile.

So every morning, the entire cage is scrubbed thoroughly with hot water and a strong soap and is then rinsed several times. And every evening several buckets of water are boiled on a gas plate and placed in a large metal container where it cools to just about the right temperature for use the following morning. Incidentally, the snakes absorb most of the water they use through their scales rather than by drinking. So it's necessary to place them one at a time in a water-filled concrete tank in the cage.

Exclusive Gas Installation at Incubator Baby Show

And now from snakes we jump again to incubator babies. In the Incubator Baby Show sponsored by Better Babies Inc., gas heating, cooking and refrigeration have helped develop into healthy normalcy dozens of prematurely born infants whose parents were unable to afford incubator care for them.

One of the most educational exhibits on the island, the Incubator Baby display has demonstrated once again some of the outstanding advantages of gas. The absolute dependability of temperature control provided by gas is essential in this type of infant care. The noise free operation of the gas refrigerator and the convenience of a modern gas range for use in preparing feeding formulas and sterilizing bottles are equally advantageous.

Through the glass walls of a series of little alcoves off a circular enclosure, visitors see the tiny babies in their incubators. The tops of those incubators, however, are very seldom closed for the simple reason that the constant temperature necessary for the majority of the infants is maintained all through the area by means of automatically controlled gas heating facilities.

Inside the circle off which the individual baby compartments are located are the hospital and kitchen, both of which are presided over constantly by registered nurses and a staff physician. The kitchen is equipped with one of the latest model gas ranges on the market and a gas refrigerator. The installation is a gas one throughout.

One of the incubator babies gives indication of a future heavyweight champion.

Diving Girls Protected By Gas Heat

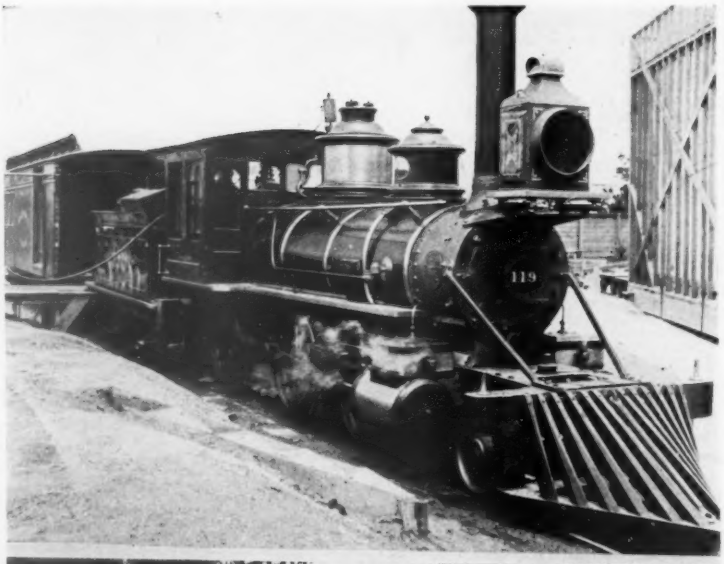
Still another unique use for gas on the Fair's Gayway is found at the Hollywood Bathing Beauties show. On the back wall of an open-front enclosure there is a painted target. In the center of the floor is a large tank filled with water. At either end of that tank a bathing girl sits on a specially constructed chair. The customers are sold baseballs to toss at the target. When a patron succeeds in hitting the bullseye, an electrical switch is closed which in turn tips over the chair of one of the bathing girls, dumping her into the water.

Obviously the job would be a dangerously cold one—except for gas. The problem is solved by use of a large gas water heater through which the water is pumped constantly, being maintained at a temperature of 80 degrees, and a gas circulating heater which keeps the temperature inside the room at close to 80. Although the front is open, the heater is so placed and a part-length curtain is used in such a way that there is no difficulty in maintaining the desired temperature even when it's cold outside.

Then there's the exhibit of "Glass Blowers of The World" where without gas there could be no show. At each of two high counters, one at each side of the building, are glass blowing furnaces where imported experts in fancy glass blowing turn out art objects of rare beauty. The furnaces consist of pairs of jets the flames of which are turned head-on. The spot where the two flames meet is where the heat is greatest and where the tubes of glass are held until thoroughly soft, then lifted to the lips of the glass blower. The jets used are of practically the same type employed in an ordinary chemical laboratory.

Even in the gigantic pageant "Cavalcade of the Golden West" which is staged on the largest stage ever built with a cast of 300 actors and "props" ranging from guns to horses and locomotives, gas plays an important part. In the scene of the production where two lines are linked by a golden spike to form the first transcontinental railroad, two ancient locomotives and a car each are brought onto the stage under their own power.

Fueling of the ancient wood burning boilers presented something of a problem. But gas came to the rescue. On either side of the stage near the track where the locomotives are stored, a gas outlet was installed. To these outlets were connected hoses and valve-controlled nozzles. A few minutes before a locomotive is to move on stage, the engineer simply pushes the gas hose nozzle into the firebox. Thus, steam pressure is quickly built up to a point where wood will maintain it while the engine moves out, waits for the ceremony and comes back.



"Cavalcade" locomotive being fired up with gas. The base at the left carries gas to the firebox.

Hot dog stands like this are heavy users of gas at the S. F. Fair.

Heating Water For Livestock

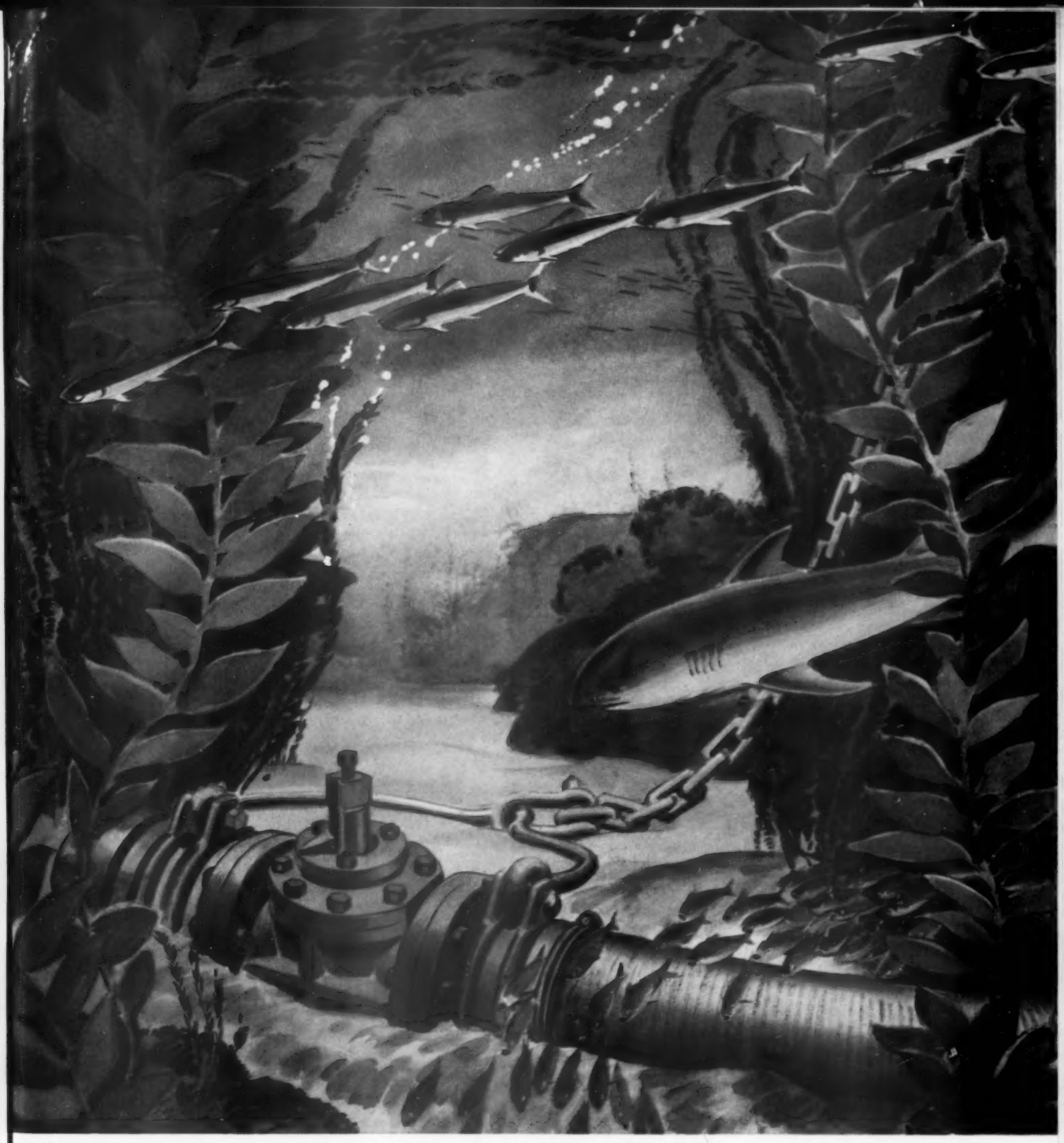
At the California Livestock Pavilion where the finest stock specimens in the state are on exhibit, gas is consumed at the rate of 1,300 cu. ft. per hour for heating water to wash the animals and the barns. Thousands of gallons of water are used every day for this purpose.

The number of unique and spectacular uses for gas at The Fair is almost unlimited. But turning away from them, consider some of the more prosaic uses.

Restaurants on the island, sometimes called on to feed 150,000 to 175,000 people in a single day, use a tremendous amount of gas for cooking, hot water heating for dish washing and so on. Some of the larger restaurants use gas fired dish washers exclusively. Practically all of them heat their water by gas.

In some single restaurant installations the consumption averages as high as 800 cu. ft. per hour. More than one establishment has as many as eight large restaurant ranges. The water heating load ranges from 20,000 B.T.U. heaters to 150,000 B.T.U. per hour.

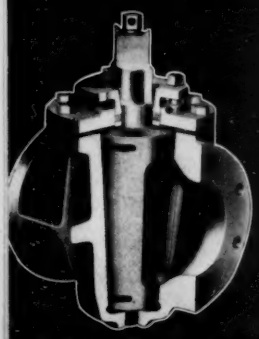
(Continued on page 21)



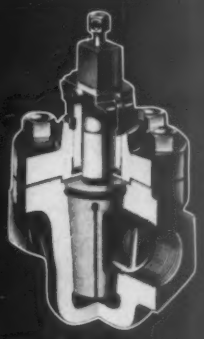
. . . Not a Leak in an Ocean

Terminating in the briny Pacific, almost a half mile from the California shore, a 16″ pipe-line carries crude oil to deep water to load tankers. Drastic laws warn against contamination of the water. A tight shut-off was imperative. Corrosion had to be thwarted, too. Valves with exposed, threaded stems were inadequate. Only a Nordstrom Lubricated Valve could serve the need—and it has served for years. It provides an absolutely *blind* ending for the 12″ flexible hose which connects to the 16″ submerged oil line. Not a drop of oil can leak out; not a drop of salt water can intrude. The hydraulic seal of lubricant which completely envelops the plug ("Sealdport" patent) makes the Nordstrom Valve *impervious* to leaks—regardless of line contents—for oil, gas, air or chemicals. It's the *all-purpose* valve for *your* service.

NORDSTROM VALVES



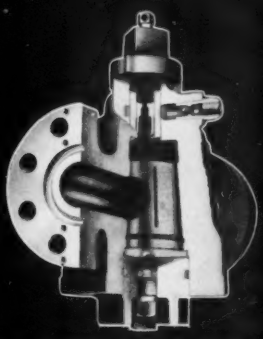
EMCO-NORDSTROM TYPE



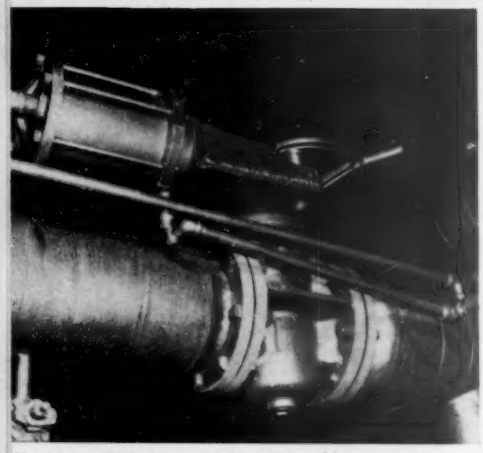
NORDCO STEEL TYPE

STANDARD TYPE

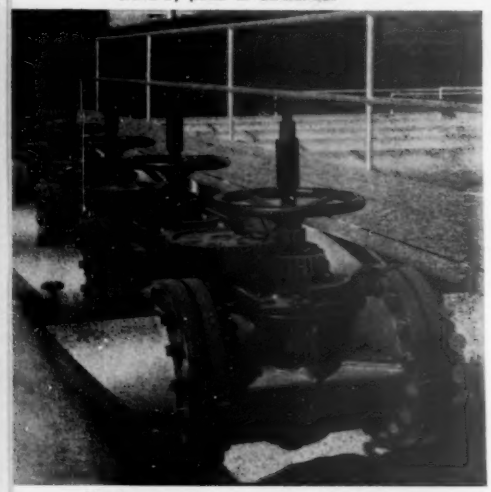
HYPRESEAL TYPE



Round Opening HYPRESEAL TYPE



Nordstrom 10" Valve, hydraulically-operated, in butane stand-by plant in California.



Nordstrom Valves on gas lines in a California metering station.

Nordstrom Valves on natural gasoline compressor discharges. Note handwheels mounted above walk-way for control from upper level.

Photo shows unique arrangement of welded gas pipe installed in Wyoming on an 18" loop line. Also shows wrinkle bending both in the 18" loop line and 10" cross-over lines. Nordstrom Valves are used.

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(1) Detail of South Entrance, Gas Industry Exhibit.
(2) General View of Gas Industry Exhibit Looking South.
(3) General View Looking North.

Besides all the better restaurants, there are dozens of hot dog stands scattered over the island which have cooking and water heating loads ranging from 20 to 50 cu. ft. per hour. Yes, gas is the favorite fuel at Treasure Island!

Appliances Conspicuous In Model Homes

Kept before numbers of exhibitors and their employees through its multiplicity of uses on the island, gas is brought to the attention of the general public through the elaborate gas industries exhibit in the Homes and Gardens Building and through the prominence of gas appliances in model homes.

Appliances ranging from water heaters to ranges and forced air furnaces are used in at least a half dozen of the most outstanding model homes in the model home group. The "Californian," the "Pine Home" and the "Treasure Model Home" are a few of the ouststanding ones where gas appliances are conspicuous.

In its elaborate gas exhibit, which occupies some 12,000 feet of floor space, the Pacific Coast Gas Association has done an enviable job in impressing the average housewife visitor with the fact that gas is truly the modern fuel. While the architecture used is of a comfortable Spanish style, everything inside the exhibit is distinctly modern in tone.*

At the entrance of the patio, which is surrounded by a group of houses in Spanish style, is a striking information desk built around a high pressure diadem gas street lamp. Thus, the visitor's very first view of the exhibit brings to her attention one of the many and varied uses for gas.

To the visitor's left as she enters is a series of model rooms (rooms representing every section of the home) featuring gas furnace installations of various types. To the right of the information desk is the home planning department where the visitor may view everything from an all gas kitchen to colored plans for all-gas homes. In charge of this department are experts who can provide the visitor with detailed information on every conceivable phase of gas usage.

Wall space through the balance of the exhibit is devoted to window showings of all types of appliances. Above the display level the walls are decorated with striking photo-murals depicting the progress of the gas industry, the convenience and utility of modern gas appliances.

Model Kitchens on Revolving Stage

At the far end of the room is an ingenious revolving stage on which are built seven complete model kitchens. Pie-shaped, the stage is divided into sections in the shapes of pie wedges. Each kitchen is done in a different decorative scheme, each one features a different range.

Operation of the stage is fully automatic. One section is exposed for four and one-half minutes, then another appears. Also automatic is the demonstration of appliances shown. First the oven door on the range slowly opens, then the broiler door and so on until each operation of each appliance has been demonstrated.

At the same time the parts of the appliances are being automatically demonstrated, a picture is projected onto the kitchen window showing the featured appliance in actual use. A voice describes the actions of the woman pictured, the advantages of the appliance.

Additional personal demonstrations are also in constant progress on the floor. A gas ironer, for example, is in constant use here.

"Gas Industry Day" At Treasure Island

The Annual Convention of P. C. G. A. is being held at San Francisco September 6, 7, 8 and 9 and will truly be an exemplification of "Gas on Parade." It will be climaxed Saturday, September 9, which has been designated as "Gas Industry Day" at the World's Fair on Treasure Island.

* *See* American Gas Journal, *March and April, 1939.*

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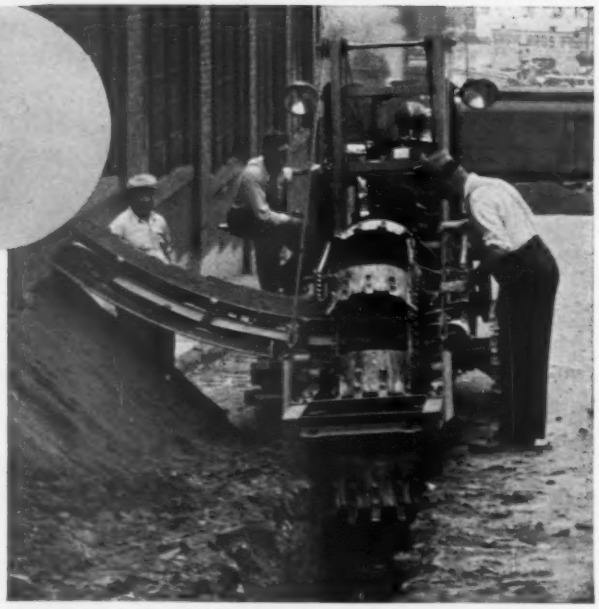

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Liability of Gas Company for Injury to Persons And Property Caused By Gas Leaks

By

Leo T. Parker

Attorney at Law
Cincinnati, Ohio

ACCORDING to the records of leading and higher court cases, all injuries to persons and property, caused by leakage of gas, may have been prevented if someone who had it within his power had used care (1) to prevent the leak; or (2) to stop the leak; or (3) to prevent an explosion.

In other words, it seems that in every case, involving an injury resulting from escaping or leaking gas, some person had sufficient knowledge of the lines, equipment or likelihood of the leak, that injury could have been prevented had this person used an ordinary degree of care.

Therefore, for this reason the higher courts are in accord with the legal rule that the one is responsible whose negligence, or lack of ordinary care, was the proximate cause of the injury.

Proximate Negligence

Various higher courts have held that when an accident occurs as a result of negligence of both the gas company and a property owner, the one whose greater negligence was the proximate cause of the injury is liable. Sometimes the original act of negligence, the primary causation, may be in its nature so continuous that the concurrent wrongful act precipitating the disaster will in law be regarded not as independent, but as conjoined with the original act to create the disastrous result.

Another important point of law is that the rule that a company engaged in distributing gas is held to a very high degree of care to see that in its distribution, and while under the control of the distributor it shall not be permitted to harm anyone, is limited to the time that the gas is contained in the gas company's own pipes or containers, unless it has negligently allowed it to escape, or, having escaped, has created a dangerous hazard known *or which should be known to the distributor*, and he has neglected to remedy the condition. It is well established law that the one in actual control of the thing which caused the injury always is liable, if his negligence was the proximate cause of the injury.

For illustration, in Davidson v. American Gas Corporation et al., 89 Pac. (2d) 1103, reported May 26, 1939, it was shown that a house was damaged by fire resulting from an explosion of leaking gas. The explosion was caused by the exhaust of the gas company's truck sent to the house for the purpose of service. The line from which the gas leaked was in control of the gas company, and testimony showed that the company's employes were negligent. Therefore, the higher court upheld the lower court's decision, holding the gas company liable, and said:

"To justify the invocation of the rule, the instrumentality which caused the injury must have been under the exclusive management of the defendant (gas company) and it does not apply where the cause of the accident is unexplained and might have been due to one of several causes, for some of which the defendant is not responsible. In view of the fact that the escaping gas was ignited and the remaining evidence produced indicates that the only reasonable inference that could be drawn from the circumstances was that the back-fire from the exhaust ignited the excess escaping gas, we feel that the court was reasonably justified in finding that the damage was the result of appellant's (gas company's) negligence."

Higher Court Upholds Jury's Verdict

Unless the testimony proves that gas company officials or employes were negligent toward their duty and responsibility, the company is not liable in damages for injuries sustained by consumers as a result of defective gas lines or other equipment. In other words, an important consideration is: When a person or property is injured whose negligence was the direct cause of the injury?

Various higher courts have held that gas company officials and employes are legally bound to exercise the same degree of care to safeguard consumers against injuries that presently is being used by other experienced and prudent officials and employes of other gas companies and under the *identical* circumstances of the injury. That is a broad statement and generally a large amount of testimony must be given in order to determine whether the officials and employes used the required degree of care to prevent the injury. And after the testimony has been presented a jury will render its decision to the best of the ability of its members.

Generally speaking, a higher court will uphold the jury's verdict, unless the testimony indicates that its verdict was not based upon the evidence presented, or that the verdict was otherwise inconsistent with the testimony.

Therefore, if the evidence presented to a jury proves that an injury caused by a gas leak may have been prevented by exercise of ordinary care, on the part of the gas company employes, then it is infrequent that a higher court will reverse the verdict rendered by a jury.

For example, in Bush Production Company v. Hayes, 126 S. W. (2d) 453, reported April 25, 1939, it was shown that a gas company's transportation line passes in front of a home at a distance of some 40 to 50 feet therefrom. The owner of the house sued the gas company for damages and alleged that inhaling gas which escaped from the line, caused her serious and permanent illness. A physician testified that he had treated her for several years, that she was very nervous, and that her condition was worse as a result of inhaling the gas. He said that the smell of the gas was very noticeable when he visited her home and he commented upon the odor of the gas. Other witnesses testified that gas had escaped for a long period of time from the line and that its smell was very noticeable in and near the woman's home.

In view of the fact that the gas company employes had known for a long time that the gas was escaping from the line and, also, that the gas

company employes had failed to repair the defect causing the leak, the jury held the gas company liable for $750 damages. The higher court upheld the verdict, saying:

"Our examination of the record discloses that there was sufficient evidence to justify the submission of the case to the jury."

Company Employes Negligent

As above indicated a gas company always is liable in damages for injuries caused by escaping gas if the testimony shows that the gas escaped through negligence, or lack of ordinary care, of the company's employes. Of course, if the testimony indicates that the gas company employes exercised care to discover and stop a leak the company is not liable because in many instances, under these circumstances, another person may have avoided the accident had he used ordinary care.

Obviously, in view of this explanation if a gas consumer complains on numerous occasions that he detects escaping gas and the gas company, or municipality, fails to stop the leak the corporation is liable for all injuries.

For instance, in Richmond v. James, 197 S. E. 416, it was disclosed that all of the piping leading from the gas main up to the meter, including the nearby intervening stopcock, was installed and owned by the city which owned the gas plant. All of the piping and fixtures in the building located beyond the meter were installed and owned by the property owner.

The property owner had for some time been conscious of the odor of gas in her home and she complained to the city. A city employe came out to the residence and inspected the piping but failed to discover the leak. The property owner complained again but the trouble was not detected and repaired by the next employe who was sent out to the home.

The property owner continued to complain and finally she was made violently ill by the fumes. She remained in a hospital for several weeks and then filed suit against the city to recover damages. In view of this above mentioned testimony, the higher court held the city liable in heavy damages, and said:

"To complaints made by her the defendant (city) sent inspectors who were unable to locate any escaping gas, or even detect any odor thereof."

Also, in Southern Indiana Gas Co. v. Tyner, 49 Ind. App. 475, the higher court held that if a gas company after obtaining information that the pipes in a building, through which it furnishes gas, are leaking, and its employe undertakes to find and repair such leaks, and either fails to repair the same, or negligently repairs them, and then continues to furnish the gas through such defective pipes, the company is liable for any resultant injuries.

The negligence in cases of this kind consists in the furnishing of the gas through the pipes after obtaining the knowledge or information that would indicate to a person of ordinary care and prudence the danger of allowing the gas to pass through such pipes.

Consumer Negligent

As above indicated either a municipality, or a gas company or other person is liable for injury to persons, or property, caused by his own negligence.

Therefore, if a consumer is injured as a result of his own negligence in failing to report escaping gas, or for any other reason, he is not entitled to recover damages. This is so because he is "contributory negligent." The courts consistently hold that any person is contributory negligent if he does not use that ordinary care to protect himself against injury.

For example, it is contributory negligence for a property owner to use a match when trying to discover a gas leak. This is particularly so if a property owner knows that gas is present. Also, a property owner is contributory negligent if he knows that gas is escaping and he fails to notify the gas company, or employ a competent person to stop the leak.

For illustration, in Newland v. Winfield, 289 Pac. 402, it was disclosed that a property owner failed to notify the gas company, or a competent person, that gas was leaking in his house but he used a match to investigate and an explosion occurred. He sued the gas company for damages for the injuries sustained but the higher court held the city not liable, saying:

"When he . . . . discovered the odor of gas it was the proper time to shut it off and call a plumber or employe of the company to find and mend the leaking pipes."

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A Brief History of the Natural Gas Operations of Glenn T. Braden and Associates in Oklahoma 1905 to 1921

Part 1

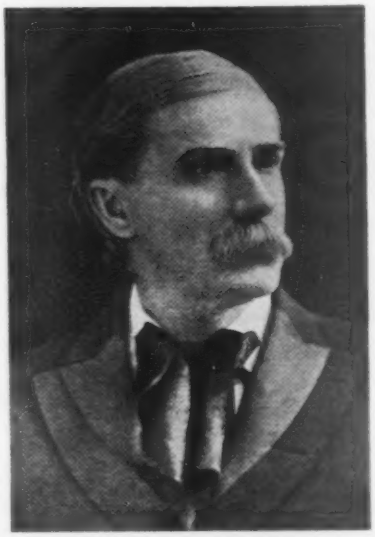
R. H. Bartlett

By

R. H. Bartlett

IN starting this brief history of the natural gas operations of Glenn Braden and his associates in Oklahoma, my thoughts go back to the very start of operations in old Indian Territory and the Osage Nation, before statehood. Gas operations in this part of the Territory were really started by Col. J. M. Guffey of Pittsburgh, Pa., about 1903. He and his partner, Mr. John Galey of Beaver Falls, Pa., had been operating in Texas as the J. M. Guffey Petroleum Company and they had previously opened the famous Spindle Top Oil Field near Beaumont, Texas. Mr. Guffey's company was afterwards the nucleus of the great Gulf Corporation, organized a few years later by the Mellons of Pittsburgh.

Colonel Guffey, who was an uncle of the present Senator from Pennsylvania, came into Indian Territory as a "wild catter". A representative of Colonel Guffey came to Tulsa in 1903 to look things over. On recommendation, Guffey and Galey, as a partnership, purchased about 155,000 acres in the Osage Nation, the largest block of about 107,000 acres cornering in the southeastern part of the Osage Nation, right down to the town of Tulsa. I believe a part of the present Tulsa Country Club was in this lease. The other block was nearly 50,000 acres, just west of Bartlesville. This acreage was acquired from Vern Foster's uncle, who had taken up about 1,500,000 acres from the Osage Nation, with the approval of President Cleveland in 1896, for a term of ten years. The lease was known as the Foster Blanket Lease. This big lease was put into the Indian Territory Illuminating Oil Company, which is one of the major oil companies still operating in Oklahoma, with offices in Bartlesville. I believe 25% of the stock of this company is still owned by Mr. Vern Foster of Bartlesville. The rest belongs to Cities Service Gas Company.



James McClurg Guffey

The writer of this history, Mr. R. H. Bartlett, is Chairman of the Board of the Union Wire Rope Corporation of Kansas City, Director of the Fourth National Bank of Tulsa and a private Financial Consultant.

The firm of Guffey and Galey started "wild cat" operations both northwest a few miles from Tulsa and west from Bartlesville. They developed a small oil pool near Bartlesville and some small oil and gas wells north of Tulsa a few miles.

In 1904 they received a 25 year franchise in Tulsa and laid a gas line, part 2" and 3", to Tulsa and built a distributing plant. They connected up all consumers and had about 250 to 300; by the spring of 1905 they had about 400 consumers. They organized the Arkansas Valley Oil & Gas Company and operated under that company. Field operations were continued, and they drilled in a few more small oil and gas wells. At this time there were three small pools of oil in Oklahoma: The one around Bartlesville, the one north of Tulsa in the Osage, and one at Red Fork. The Prairie Oil & Gas Company was operating in Chautauqua and Montgomery Counties in Southern Kansas, buying oil from those pools, which had been developed a little earlier. Mr. James O'Neill was then President of Prairie Oil & Gas Company, and became interested in laying a 6" oil line to Tulsa to pick up this oil. His plan was to extend this line south from Kansas down the 96th Meridian Line.

Standard Oil Interests

The Standard Oil Company then owned the Prairie Company. Mr. H. H. Rogers was President and Johnnie Archabald was Vice President of the Standard. In the summer of 1904 they decided to come to Oklahoma, or rather Indian Territory, to look the situation over, before laying this line.

They went to Pittsburgh and picked up Mr. Glenn T. Braden, who had been for years one of their most dependable oil and gas pipe line men in Pennsylvania and West Virginia. Mr. Braden started working for the Standard Oil Company interests as a boy of 14 or 15, back in about 1872 or 1873, and advanced to the position of General Superintendent of the Southwest Pennsylvania Pipe Lines. Later he became President and General Manager of the South Penn Oil Company, and in 1904 was President and General Manager of the Hope Natural Gas Company, which company was then laying an 18" gas line from West Virginia field to Cleveland, Ohio. Mr. Rogers picked up several of his field men on his trip to Independence, Kansas, and they, with Mr. O'Neill, came down to Tulsa and drove to Red Fork and into the Osage in buckboards, as there were no automobiles in this country at that time. A few autos began to show up two or three years later, but they couldn't go out in the country very far on account of the roads,—or rather, lack of roads.

On this inspection trip Mr. Braden, with his thirty years of experience in the eastern oil and gas fields, became enthused over the country and was very outspoken in his predictions for the future. In fact he made a written report of his trip in which he prophesied to Mr. Rogers that this country would go far beyond what they had ever had in Pennsylvania and West Virginia.

Prairie Builds New Line

The result was that the Prairie built the oil line, previously mentioned, thus creating a market for this oil. Then things began to start around Bartlesville and Tulsa. Tulsa got busy and built a new hotel—the Robinson—at the corner of Main and Third. The oil men, on account of this new hotel, began to make Tulsa their headquarters.

Mr. Braden returned to Pittsburgh and reported to his old friend, Mr. T. N. Barnsdall, afterwards the father of the present Barnsdall Corporation, his great hopes for this country. Mr. Barnsdall was then the largest independent oil operator and wild-catter in the Eastern fields. In fact, his father, William Barnsdall, drilled the second oil well following the Drake well at Titusville, where he lived. He also built the first refinery in the oil fields of Pennsylvania. Mr. Braden and Mr. Barnsdall decided to come to Indian Territory and pick up some stuff, as the old timers used to refer to taking up oil and gas leases. They both were old friends of Col. J. M. Guffey, and Mr. Braden was a stockholder in the J. M. Guffey Petroleum Company of Texas. Mr. Braden approached Mr. Guffey in regard to purchasing his Arkansas Valley Oil & Gas Company properties. This was in the early spring of 1905.

Guffey Sells Holdings

It just so happened that in March 1905 Tulsa had one of its coldest spells of winter weather. In fact I don't believe it has ever been as cold since. The temperature went to something like 16° below zero.

The gas line from the Osage froze up and the town of Tulsa was out of gas. This, together with the fact

Glenn T. Braden

that Mr. Guffey had spent quite a lot of money wild-catting, with only meager results, influenced him to sell his holdings. On April 1, 1905, Barnsdall and Braden purchased all the Guffey-Galey properties in Old Indian Territory, including the gas plant in Tulsa and these two large blocks of acreage in the Osage.

This deal was for $1,250,000, Mr. Guffey taking a mortgage for $800,000 and $450,000 cash. This was the first large deal in the Territory and really started the oil boom in and around Tulsa.

Barnsdall and Braden then organized their first company in the Indian Territory, The Osage & Oklahoma Company. You will note they used the name "Oklahoma", which was the first time the name was used in connection with oil and gas operations.

The O & O was capitalized for $1,500,000; and Barnsdall and Braden, with a few of their friends in Pittsburgh, purchased this stock at $36 per share, to raise the $450,000 cash paid Guffey and Galey.

The original officers of the Osage & Oklahoma Company were as follows:

Mr. E. P. Whitcomb of Pittsburgh, Pa., then Treasurer of Barnsdall's Union Natural Gas Corporation, was President.

Mr. Glenn T. Braden was Vice President and General Manager.

Mr. R. H. Bartlett, then Cashier of the Union Natural Gas Corporation of Pittsburgh, was elected the Secretary and Treasurer.

(Whitcomb and Bartlett were Barnsdall men).

The Osage and Oklahoma Company opened offices in the Farmer's Bank Building, Pittsburgh, Pennsylvania, and took over the Tulsa office and field organization of the Arkansas Valley Company. Mr. Gus Springer was the production superintendent. Mr. E. R. Minchell was the engineer, and he and Mr. Springer made locations for wells in the Osage. The O & O spent upwards of $200,000 the first year in wild-cat drilling developing, mostly natural gas.

The Tulsa Oil Boom

During the summer and fall of 1905 oil men continued to come from Pennsylvania to Tulsa. It was then that Tulsa started her great oil boom. The majestic city was later to become the Oil Capital of the World.

The Osage and Oklahoma Company continued to operate its gas plant in Tulsa. The population of the city quickly doubled. In the spring of 1905 there were 400 consumers in Tulsa. The gas plant began to increase, and we had to connect additional wells and lay a 4" line from these new gas wells to Tulsa, a distance of about five miles.

We found we needed an experienced man in charge of the gas plant and office in Tulsa; and in the late fall of 1905, Mr. W. H. Bagley was sent here from Crestline, Ohio. He had been connected with the Logan Natural Gas Company in Ohio as an auditor. We then sent Mr. Frank Martin out to Tulsa, an experienced man to take charge of the gas field and lines.

In 1906 Barnsdall and Braden made the second big deal in Oklahoma—that is, it was a big deal for those early days.

Mr. Barnsdall organized the Barnsdall Oil Company, with offices in Bartlesville, and purchased the oil rights on all the Osage acreage from the Osage and Oklahoma Company, about 155,000 acres. The Barnsdall Company assumed the $800,000 mortgage and other debts of about $200,000, so that the deal was about $1,000,000 and the Osage and Oklahoma Company retained the gas rights in this acreage, plus the gas lines and distributing plant in Tulsa. Both companies continued to operate this acreage, but if Osage and Oklahoma drilled an oil well it was taken over at cost by Barnsdall, and the reverse was done when Barnsdall drilled a gas well.

Osage Operations

In 1906 this Foster blanket lease, covering all of the eastern half of the Osage Nation, was renewed in Washington for ten years—to March 16, 1916.

A little later, Mr. Gus Springer left our organization to start operations in the Osage in partnership with Dr. Sam Kennedy, and this firm became very successful a few years later. About June, 1906, Mr. Robert Galbreath drilled in his famous first oil well in the Glenn Pool; and the opening up of this field bore out Mr. Glenn Braden's prediction of 1904. Mr. Galbreath and associates also developed some gas and laid a 6" line, under the name of the Galbreath Gas Company, into Tulsa, in competition with the O & O Company. The result was a gas rate war, resulting in a 5c rate per M for a period. In fact the O & O Company made a five year contract with the old Commercial Club of Tulsa for industrial gas at 3c per M. Cooperation of that character is what helped to build Tulsa in those early days.

My memory goes back to the summer of 1906 when Archie Leonard, representing the Devonian crowd, drilled the first gas well in the Hogshooter Field, Township 23, Range 14, I believe, southwest of Nowata. I remember Mr. Braden sending a message to Frank Martin, then Gas Superintendent for the Osage and Oklahoma Company, requesting him to go up there and get a test of this well, sending it to our Pittsburgh Office. I remember Frank's report at that time stated it was the best looking gas well he had seen in this country up to that time, and that it looked more like a West Virginia gas well than any well in Oklahoma. It showed about thirty million open flow volume, with the original rock pressure averaging what a well at that depth would be.

Oklahoma Natural Gas Co.

About that time, Benedum-Trees and Barnsdall drilled one or two gas wells over near Cleveland, Oklahoma, south of the Arkansas river. H. M. Byllesby & Company of Chicago, which owned the Oklahoma Gas & Electric Co. including the artificial gas plant at Oklahoma City, considered the building of a pipeline from Oklahoma City to these wells near Cleveland; and their attorneys, Flynn & Ames of Oklahoma City, organized the Oklahoma Natural Gas Company with a capital of three million dollars ($3,000,000), for the purpose of having this company build such a pipeline. However, after the well came in in the Hogshooter field, Glenn Braden, in Pittsburgh, made a deal with the Jennings Brothers of Pittsburgh covering the gas rights on some five thousand acres of leases in Townships 23 and 24, Range 14, pretty well scattered through this Hogshooter field. After making this deal, Mr. Braden left Pittsburgh for Bartlesville, with the idea of driving over to Nowata to inspect this gas well which Martin had reported. When he landed in Bartlesville, he was surprised to meet T. N. Barnsdall there, and in conversation with Barnsdall told him he had picked up this Jennings acreage. Barnsdall said he had come out to investigate this same gas well, having in mind to buy this acreage from the Jennings Brothers. With the usual method pursued by old-time operators, Braden promptly said to Barnsdall—"Thede, you can have a piece of this deal and come in with me." Barnsdall said, "All right, Glenn, I will take two-thirds of it"; Braden laughed and said, "Well I had in mind splitting the proposition fifty-fifty, but if you want two-thirds of it, we will go ahead on that basis." This deal was all done verbally in a ten minute talk. I think Mr. Braden paid $10.00 an acre for this gas acreage. Mr. Braden gave notes to the Jenning Bros. for this acreage, charging two-thirds of it to Barnsdall on his books, which amount was finally paid up by Barnsdall several years later by turning over stock to him in the Oklahoma Natural Gas Company.

T. N. Barnsdall

Caney River Gas Co.

In the fall of 1906 the Devonian crowd, headed in Tulsa by J. H. Evans, and A. W. Leonard, organized the Caney River Gas Company, with a capital stock of $1,000,000. They borrowed $500,000 and built an 8" gas line from this Hogshooter Field to Muskogee, supplying Claremore, Pryor, Wagoner and other small towns along the line, including Muskogee, then the largest city in the old Indian Territory. The Caney River and the Oklahoma Natural finished their main pipe lines about the same time. At that time the Oklahoma Natural 12" line was only finished a few miles north of Sapulpa. In fact it never reached the Hogshooter Field, but was later extended to the Collinsville gas field. During 1907 the Oklahoma Natural extended an 8" line to Guthrie and also to Shawnee. Braden and Barnsdall then started in to operate this acreage in the Hogshooter district.

Mr. Braden hired Jimmy Lawry of Titusville, an old oil and gas man, to go to Nowata and superintend the drilling of these gas wells. In the meantime, the Devonian crowd drilled quite a number of additional wells, and by the spring or summer of the following year, 1907, between them, they had drilled more than thirty wells, with 500,000,000 cubic feet of open flow volume. Braden and Barnsdall and the Caney River Gas Company crowd pooled their acreage, amounting to ten thousand acres, and this 500,000,000 cubic feet of gas, and immediately began turning their eyes southwest to Oklahoma City, Shawnee, Guthrie, and Tulsa, with the idea of building a twelve inch trunk line from this field to connect up with the cities and towns along such a pipeline.

Hogshooter Deal

This ten thousand acres in the Hogshooter Field and 500,000,000 cubic feet of open flow volume was

turned into the Oklahoma Natural Gas Company for its entire capital stock of $4,000,000, the capital stock having been increased from three to four million. $2,000,000 of this stock was set aside to use as a bonus with the sale of $2,000,000 in First Mortgage Bonds and the other $2,000,000 of stock was distributed to these organizers who turned in the acreage and gas wells and franchise contracts to supply these cities and towns along the line. At the start Mr. Barnsdall became the largest stockholder in Oklahoma Natural.

Oklahoma Natural Gas Reorganization

During the fall of 1906, Mr. Braden visited Mr. Arthur Huey, then Vice President and General Manager of H. M. Byllesby and Co. in Chicago, and found that they had organized the Oklahoma Natural Gas Co. and were thinking of building the pipe line to Cleveland. However, the Cleveland gas wells were petering out; and they very promptly agreed to turn over this new corporation if Braden and Barnsdall would go ahead with the pipe line, making a contract with this pipe line company to supply Oklahoma City on the old percentage basis of 75% to the pipe line company and 25% to the distributing company for industrial gas, and 66 2/3% to the pipe line company and 33 1/3% to the distributing company for domestic service, the settlement to be made each month on the basis of the registration from the consumer's meters. Mr. Barnsdall brought the charter of the Oklahoma Natural Gas Company to Pittsburgh and a new organization was then perfected. Mr. Braden was originally made Vice President and General Manager, and I was elected Secretary-Treasurer. I am not just sure, but I think, temporarily, Dennis Flynn of Oklahoma City, was put in as President. Then the following year Mr. Braden was elected President, continuing as President of the Company until he sold his stock holdings in 1921 to the Ritts-Crawford-Sharp combination. I think the original officers and directors were:

Officers

D. T. Flynn .....President
G. T. Braden .....Vice President
R. H. Bartlett .....Sec'y.-Treas.
C. B. Ames ....Asst. Sec'y.-Treas
Dennis Hastings ..General Manager

Directors

D. T. Flynn .....Oklahoma City
T. N. Barnsdall ....Pittsburgh, Pa.
E. P. Whitcomb ....Pittsburgh, Pa.
G. T. Braden .....Pittsburgh, Pa.
C. B. Ames .....Oklahoma City
Eugene Mackey ....Pittsburgh, Pa.
J. R. Leonard ....Pittsburgh, Pa. R
R. H. Bartlett .....Pittsburgh, Pa.
Harry Heasley ....Pittsburgh, Pa.
Geo. C. Priestly ..Bartlesville, Okla.
J. H. Evans .....Tulsa, Okla.

The 12", plain end pipe, weighing 33 pounds to the foot, was ordered in the early winter or spring of 1907, the greater part of it being purchased from the National Tube Company of Pittsburgh, and a part from Spang-Chalfant Company of Pittsburgh. Payment was made with notes of the Oklahoma Natural Gas Company, which notes were endorsed by several of the Directors, including Barnsdall, Braden, Evans, Leonard and Heasley.

Marketing the Securities

We then started a campaign to market two million dollars of our First Mortgage Gold Bonds, with coupons bearing 6% interest. We first made several efforts to have some bond house in Pittsburgh underwrite these bonds, but failed to get any substantial house to do this, as they claimed it was a fool-hardy move to invest two million dollars in a gas pipe line in such a hot country as Oklahoma; and they were afraid the venture would be a complete failure. We then had a Board Meeting and decided to set aside two million dollars of the capital stock, out of the four million dollars, to be given as a 100% bonus with the bonds; and the remaining two million of stock was divided proportionately among the interests which had turned in the ten thousand acres and the thirty odd wells producing 500,000,000 cubic feet of open flow volume. On account of his two-thirds interest in the Jenning Bros. acreage, Mr. Barnsdall started out as the largest stockholder of the Oklahoma Natural Gas Company. At this juncture, I was known as a T. N. Barnsdall man, having worked for Mr. Barnsdall in both his gas office and oil office in Bradford for four years; and I had been cashier of the Union Natural Gas Corporation in Pittsburgh for three years up to the time I went in as Secretary-Treasurer of the Osage and Oklahoma. As mentioned before, Mr. Braden had been a Standard Oil man for some 32 or 33 years. However, he resigned from the Standard interests January 1, 1906, to devote his entire attention to the Oklahoma Natural Gas Company and the Osage and Oklahoma Company in Oklahoma.

The marketing of these two million dollars of bonds for the Oklahoma Natural Gas Company became a very hard proposition, as the spring of 1907 saw business begin to tighten up. This, no doubt, was preparatory to the money panic which hit the country in the fall of 1907. Mr. Denny Hastings, who was Superintendent for the Hope Natural Gas Company, under Mr. Braden, was wired by Mr. Braden to come to Oklahoma as General Manager to construct the new 12" pipe line to Oklahoma City, and he first opened his office in Oklahoma City. He maintained his office there for several months, later in 1907 moving it to Tulsa, where it remained until his death in February, 1914.

Need for Construction Funds

Mr. Braden and Mr. Hastings shipped an organization from Pittsburgh, consisting of some 300 Italians, Austrians and Bulgarians, who made up the pipe line gang. They came to Oklahoma in the spring of 1907, and started work on the 12" line to Oklahoma City.

The result of the marketing of these bonds was this—that I took it upon myself to attempt to sell these bonds from our office. I secured lists of all the national banks around Western Pennsylvania and some in West Virginia and in Eastern Ohio, where oil men were doing business. Then I made numerous trips out of Pittsburgh to these banks, after getting up a prospectus of our proposition with a detailed explanation showing the location of the pipe line, a list of the cities we expected to serve, an estimate of the number of consumers we expected to serve, the approximate earnings, etc. Armed with this prospectus, I started selling these bonds through these banks to their oil and gas customers, but this developed into a very slow process; and we could not sell the bonds fast enough to raise the necessary cash to pay the payrolls for the pipe line gang. We had to establish camps, separating into two or three different gangs, buying camping equipment for them and setting up commissary departments, etc. As the summer of 1907 wore along, it became increasingly harder to market these bonds. In the meantime, Mr. Braden had developed some new production in Crawford County, Illinois, and had some very fine production around Lawrenceville, Ill. Fortunately for the Oklahoma Natural Gas Co., his production increased until he was receiving several thousand

(Continued on page 44)

Automatic Gas Water Heater Service Analyzed by Brooklyn Borough Gas Co.

The Brooklyn Borough Gas Co., Coney Island, New York, has completed an interesting survey on the matter of gas water heating. They mailed a questionnaire to 500 water heater customers on May 18th and up to August 20th had received 280 replies. The customers were asked to check the following:

1. Which advantage of your automatic GAS water heater is most important to you? Will you please read the following and rate these advantages 1, 2, 3, etc., in the order of their value in your opinion?

( ) Gas heated water is always clean, never rusty
( ) No fire tending
( ) The modern gas water heater requires absolutely no labor
( ) No fuel to order
( ) Always hot water, no matter when you turn on the faucet
( ) Constant supply all year round
( ) Moderate cost
( ) Satisfaction of tenants (if any)
( ) Controlled temperature of water an economy that also insures long life of tank
( ) Clean cellar
( ) Free Gas Company service if ever needed
( ) Beautiful piece of equipment
( ) Complete safety of operation—no danger of overheating
( ) Hot water ready when you come home, even if away all day

2. Will you add here any remarks you would like to make about the service and satisfaction you have had from your automatic gas water heater?

The following are a few of the comments made by customers:

"We are pleased with the hot water system because it's always there when needed. It never fails, and the cost is moderate enough for the comfort it gives."

"I am glad to say that I am absolutely satisfied with my automatic gas water heater and the excellent service the Company has given at all times since its installation. My only regret is that I did not dispose of my old fashioned laundry stove many years ago."

"It was difficult to determine which convenience has the greater advantage for they are all indispensable and do an excellent job in keeping us perfectly satisfied."

"No smell, no smoke, no stain, no soot."

"The fact that not once since we've had it installed has it caused us any inconvenience of any sort. Also the peace of mind it gives when we're away for a day. Not a worry or care about our heating is really worth every cent we've spent."

"I have been completely satisfied with the automatic gas water heater in every way. As far as cost is concerned, I find it even cheaper than coal, in the use of the water heater."

"I cannot recommend the automatic gas water heater enough, I found it to be the finest. We have hot water all the time and it is so clean and safe to operate and besides it is run at a moderate cost."

"A beautiful piece of equipment. The cellar is always clean. Requires absolutely no labor. The controlled temperature brings long life to the tank—and economy to you. The free service given by the Gas Company is very satisfactory."

These are only a few of typical comments. The replies showed clearly that when automatic water heating is installed it gives complete satisfaction and stays installed, particularly when efficient and courteous service is rendered by the utility.

CRUSE-KEMPER COMPANY
STEEL PLATE CONSTRUCTION
AMBLER, PA.
GAS HOLDERS
HOLDER INSPECTION
RIVETED OR WELDED FABRICATION & ERECTION
TANKS, BINS, FLUES PURIFIERS, WELDINGS

Take No Chances!
ALWAYS SAY "K-CO"
"K-CO" is the trade mark found on all high grade Gas Stops made by Kitson. By it you identify products *guaranteed* for ease of operation and freedom from leakage. By always specifying "K-CO" you assure perfect performance.
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G-201—Flathead Standard Gas Stop
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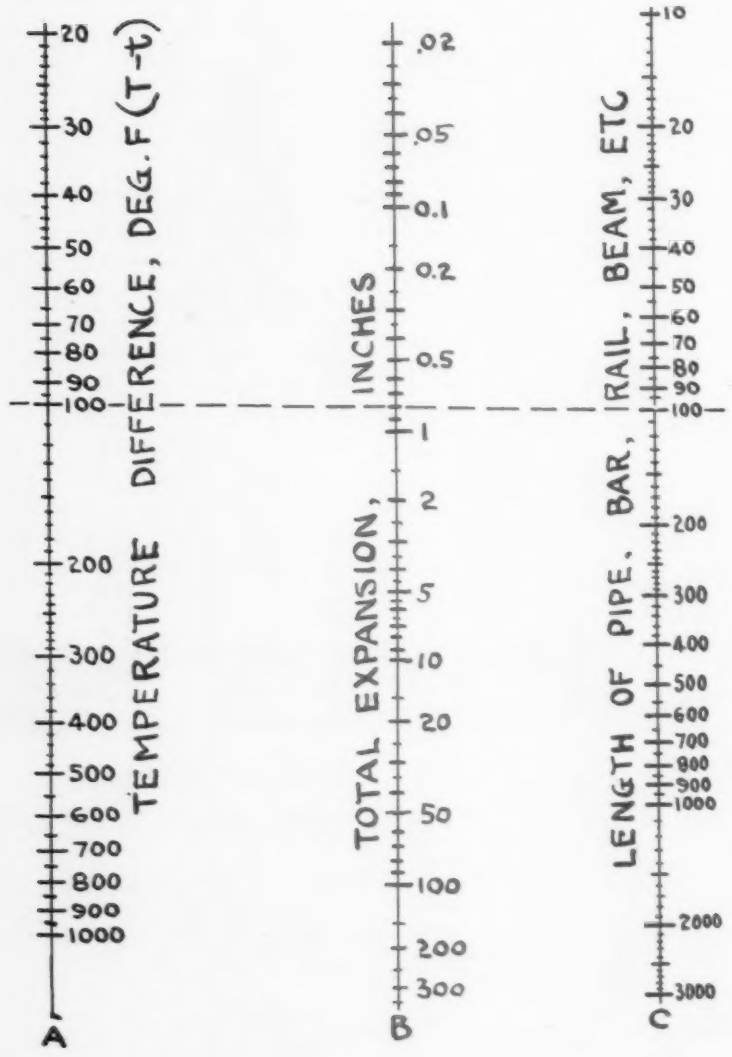
2409-15 Westmoreland St., Philadelphia, Pa.
Manufacturers of Kitson Safety Devices (Lovekin Patents) for Domestic Water Heaters . . . Quality Brass Goods for Gas, Water and All Plumbing Uses.

HERE IT IS . . .
The PITTSBURG *Gas Fired* House Heater
The "Pittsburg House Heater" will fill more universal demands than any other house heater on the market. This house heater is adaptable to any size rating up to 150,000 B.T.U. input.
•
You have only one size to stock, which reduces your inventory, means quicker turnover, less overhead, quicker sales, increased volume, greater profit.
•
The "Pittsburg House Heater" will burn all gases—natural, manufactured, mixed, artificial, liquefied petroleum, etc., efficiently and effectively.
STATE KIND OF GAS WHEN ORDERING
Send for Complete Details
PITTSBURG WATER HEATER CORP.
PITTSBURGH, PA.

A Useful Expansion Chart

By
W. F. Schaphorst, M.E.
Newark, N. J.



This chart is useful for determining the expansion in steel piping, rods, tubes, etc., for any ordinary temperature difference. It makes "longhand figuring" unnecessary.

Simply lay a straightedge across the chart once or stretch a fine black thread across, as indicated by the dotted line, and the problem is solved.

Thus if a certain steel pipe line 100 ft. long is subjected to a temperature variation of 100 deg. F., what will be the total expansion in inches?

Simply connect the 100 deg. temperature difference, column A, with the 100 ft. length, column C. The intersection with column B gives the answer as 0.8 in. That is all there is to it.

The chart can also be used for determining the allowable temperature difference where a definite amount of space is available for expansion and contraction. Thus if the length of the pipe is 100 ft. and the allowable expansion is 0.8 in. the same line would show that a temperature difference of 100 deg. F. would be the limiting amount.

Also, if the factors in columns A and B are known, the unknown in column C is immediately found. In other words, if any two of the factors are known the third is quickly found, and without any computing whatever.

The range of the chart is wide enough to care for almost any expansion or contraction problem. The temperature difference, column A, varies all the way from 20 deg. to 1,000 deg. Seldom if ever do we have as high a temperature as 1,000 deg. The length of pipe line also is great, varying all the way from 10 ft. to 3,000 ft. And the total expansion between these limits varies all the way from 0.02 in. to 300 in.

Capt. Higgins Contacts Offices in Own Plane

Captain A. E. Higgins, vice-president in charge of sales for Pittsburgh Equitable Meter Company and Merco Nordstrom Valve Company, is making a series of flying trips throughout the country. Piloting his own plane, Captain Higgins has found that he can cover several thousand extra miles of traveling to keep in close contact with the various offices of his organizations from the Pacific to the Atlantic.

During the past three weeks he has been on the Pacific Coast conferring with executives of various petroleum companies, gas corporations and public utilities. He has also conducted a series of sales conferences with west coast division managers outlining merchandising plans for the balance of 1939. Captain Higgins flew from Los Angeles to Dallas recently to remain for a few days, and is now attending the sessions of the Pacific Coast Gas Association in San Francisco.

Under Captain Higgins' direction, the sales engineering forces of his two companies are being augmented to give more comprehensive service in each territory.

Cathcart Joins Robertshaw

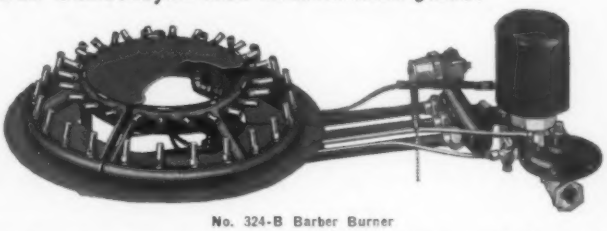
W. F. Cathcart, formerly connected with the American Gas Association Laboratory in Cleveland, has joined the Robertshaw Thermostat Company as Cleveland representative.

W. F. Cathcart

Mr. Cathcart is a graduate of the Case School of Applied Science where he obtained the degree of Bachelor of Science in Chemical Engineering in 1936. His first year after college was spent as a sales engineer with the Continental Rubber Works after which he joined the staff of the American Gas Association Laboratory where he worked in the range, water heater, space heater, chemical and research departments. The experience with the AGA is expected to be of considerable assistance to him in serving Robertshaw's customers.

BARBER BURNERS

For Successful Gas Conversion Jobs!



No. 324-B Barber Burner

▶ **No other burner has the superb combustion efficiency of the famous Barber Jet. Barber Burners deliver 1900° flame temperature on atmospheric pressure, literally scouring the heating surface with a *direct action* flame, intense and perfectly controlled—without wasting precious B.T.U.'s on intermediate refractory elements. That's logical, isn't it? That's why they generate more *resultful* heat at lower fuel cost. And that's why they generate sales appeal, sound customer relations, freedom from servicing—all GOOD BUSINESS for YOU!**

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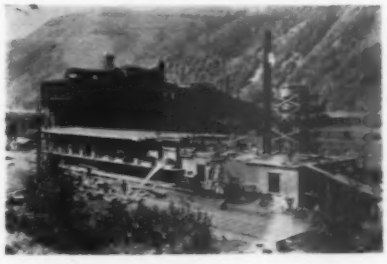
CURRAN-KNOWLES GAS AND COKE OVENS

Successfully carbonize Low Volatile, High Volatile, Swelling or Non-Swelling Coals.

Give a high yield of superior quality coke for water gas generator fuel, industrial and domestic use; a high yield of tar of excellent quality and a uniform quality of gas which meets Commission requirements.



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Substantial construction. Low initial cost per M. capacity. Low operating cost due to simplicity of design.

Built to suit any situation. Over 5 years' successful operation.

Ask for bulletins showing plants and products.

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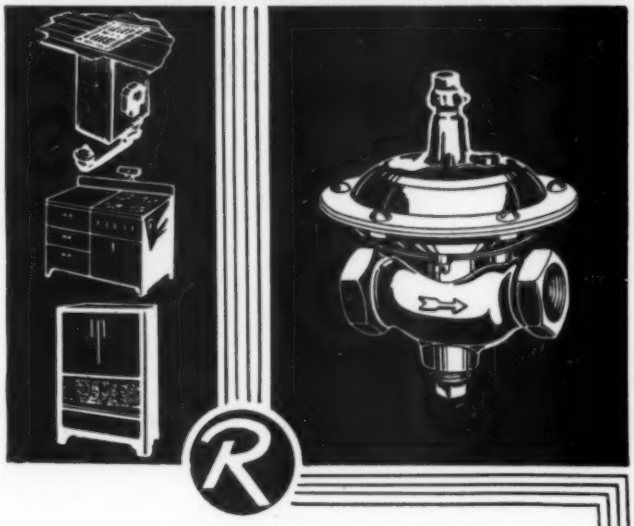
Bank of Commerce Bldg. **St. Louis, Mo.**

Accurate



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Wm. A. Ehlers, 49 S. Clinton Street, East Orange, N. J.

☆

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GAS CONTROL SINCE 1892

Something new!

Something new — definitely advantageous to you—is the Lavino Guaranteed Cost Plan whereby *E. J. Lavino and Company will guarantee, in writing, a definite maximum cost per pound of H_2S removed* — using Lavino Activated Oxides under gas purification practices recognized generally as standard!

This guarantee, as tailored to your own plant, sets a "ceiling" above which your costs cannot rise. It opens the way to a fair trial—without risk; it protects you absolutely while you see for yourself *exactly* what savings Lavino Activated Oxides can make in your own plant, under your own conditions of use.

Why not ask for your Specific Guarantee; study it, then decide? Your inquiry does not obligate you—and all that is necessary is a note on your letterhead to E. J. LAVINO and COMPANY, 1528 WALNUT ST., PHILADELPHIA, PA.

434 Installations

prove the ability of Glover-West carbonizing plants to produce gas at low cost and also make a highly reactive coke ideal for the domestic market. The tar has low water content and viscosity excellent for road material.

Write for complete details.

WEST GAS IMPROVEMENT CO.
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More than 65 years of dependable service to the gas industry.

A Safeguard on the Vapor Lines

Fulton Duplex Vacuum Regulator

WHEN used in vapor lines connected to storage tanks, for the recovery of gases, the Fulton Duplex Vacuum Regulator will prevent the pulling of a vacuum in the storage tank. When the pressure in the storage tank has been released by removal of gases, the regulator will close. It is so constructed that it cannot do otherwise. Its use affords a very definite safeguard on vapor lines. Write for Bulletin No. 2449.

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American Gas Association

Annual Convention October 9th to 12th

The program for the twenty-first Annual Convention of the American Gas Association to be held at the Pennsylvania Hotel, New York, October 9-12 is being arranged so as to give the delegates ample opportunity to see the uses of gas in the "World of Tomorrow."

The following are the tentative sectional programs:

Natural Gas Section, Monday, October 9th at 10 A. M., Thomas R. Weymouth, Chairman. There will be held a Public Relations Forum. The leader will be

B. C. Adams, Vice-President, The Gas Service Company, Kansas City, Missouri. Subjects: The Golden Rule in Business, Mr. Adams. Analyze, Organize and Deputize, E. M. Tharp, Vice-President and General Manager, The Ohio Fuel Gas Company, Columbus, Ohio. Humanizing An Organization, R. E. Fisher, Vice-President, Pacific Gas & Electric Company, San Francisco, California. Good Will, A Priceless Asset, Charles Evans, Arkansas Power & Light Company, Pine Bluff, Arkansas. Skit—The Old Way—The New Way. Election of Officers. Committee Reports. Gas Industry Luncheon. (Speaker to be selected). Adjournment for Gas Industries Day activities at the World's Fair.

The Accounting Section will meet Tuesday morning, October 10th, Chairman, H. A. Ehrman will preside. This meeting will be devoted largely to the presentation of committee reports. On Thursday, October 12th the Accounting Section Luncheon Conferences will be held.

The Commercial Section meetings will start Tuesday, October 10th, the presiding officer being F. X. Mettenet. There will be a

Symposium on Gas in New Homes. J. P. Leinroth, Public Service Electric & Gas Co., Newark, N. J.; H. Vinton Potter, Oklahoma Natural Gas Co., Tulsa, Okla.; F. M. Banks, Southern California Gas Co., Los Angeles, Calif. Market Possibilities and Equipment Available for Summer Air Conditioning by Gas, A. W. Lundstrum, Ebasco Services, Inc., New York, N. Y.

On Wednesday, October 11th, will be held the "Get-together" Blue Plate Luncheon at 12:30 P. M., at whch various domestic uses of gas will be discussed.

The Industrial Gas Section meets on October 10th and 11th at 2 P. M., with a luncheon at 12:15 P. M. on the 10th; F. H. Trembly, Jr., Chairman.

Among the subjects to be presented are

Reasons Why Gas Is Forging Ahead in the Metals Field. Beating Competition by Refining Industrial Gas Applications. The Application of Gas to the Quick Drying of Printing Ink. Successful Methods of Selling Standard, Rated Industrial Gas Furnaces. Are You Taking Full Advantage of Your Industrial Gas Publicity?

The Utilities and Manufacturers—A Team for Increased Sales. Report of Committee on Nominations. Election of Officers. A Review of Progress in Certain Industrial Fields. An Analysis of Gas at Work in the World of Tomorrow. A Hotel Man Looks at Gas Service.

Technical Section meetings will convene on the 10th and 11th at 2 P. M. Following the opening remarks of Chairman F. M. Goodwin of Boston, Consolidated Gas Co., and the report of J. V. Postles, Chairman of the Nominating Committee, the program will include these subjects:—

Potentialities of Future Production Costs, L. J. Willien, Public Utility Engineering & Service Corp., Chicago, Ill. Load Factors and Increment Costs in Transmission and Distribution of Gas, E. L. Fischer, United Light & Power Service Co., Davenport, Iowa. Gas at the Fairs, C. S. Goldsmith, The Brooklyn Union Gas Co., Brooklyn, N. Y., and R. S. Fuller, Pacific Gas and Electric Co., San Francisco, Cal. The Engineers of Tomorrow. (Speaker to be announced). Ten Years of Gas Dehydration, W. L. Shively, Koppers Co., Pittsburgh, Pa. Report of Gas Conditioning Committee, O. S. Hagerman, *Chairman*, Atlantic Seaboard Corporation, New York, N. Y. Report of Committee on Organic Sulphur, R. E. Kruger, *Chairman*, Rochester Gas & Electric Corporation, Rochester, N. Y. Report of Gas Production Committee, F. B. Parke, *Chairman*, The Brooklyn Union Gas Company, Brooklyn, N. Y. Report of Distribution Committee, C. F. Turner, *Chairman*, The East Ohio Gas Company, Cleveland, Ohio. Report of Chemical Committee, E. M. Bliss, *Chairman*, Public Service Electric and Gas Company, Harrison, N. J.

So. California Gas Co. Announces Executive Changes

Retirement of the president and the chairman of the board, and election of a new president were announced Aug. 29 by the Southern California Gas Company, following a meeting of directors at the company's offices, 810 South Flower street.

The two executives who retire are Addison B. Day, board chairman, and Alexander B. Macbeth, president and general manager, both of whom leave active service on September 1. This is the date for their normal withdrawal from office under the company's long-established retirement plan. Both will continue as directors.

F. S. Wade, for many years president and general manager of Southern Counties Gas Company, which is affiliated through Pacific Lighting Corporation with the Southern California Gas Company, will succeed Macbeth. He will retain his connection with the Southern Counties Gas Company as president, but is turning over to A. F. Bridge, vice president, the position of general manager.

The fact that Wade will act as president and general manager of the Southern California Gas Company and president of the Southern Counties Gas Company, it is pointed out, does not mean that any merger of the two systems is contemplated. Both companies will continue to operate as entirely separate organizations.

SUPERIOR GAS METERS

For Sound Values and Continuous Operating Economy. Meters for Domestic and Industrial Use, All Sizes 5B to 60C.

Wet Test and Demonstration Meters
Diaphragms—Service Cleaners
Provers—Meter Repairs.

Superior Meters are built to A. G. A. specifications to provide complete protection against leaks and costly repairs. Write for details and quotations.

SUPERIOR METER COMPANY

167 41st Street ***Brooklyn, N. Y.***

Sales Floor of Philadelphia Gas Works Company Has Customer Appeal

By
L. C. Heiss
Supervisor, Display Division
The Philadelphia Gas Works Company

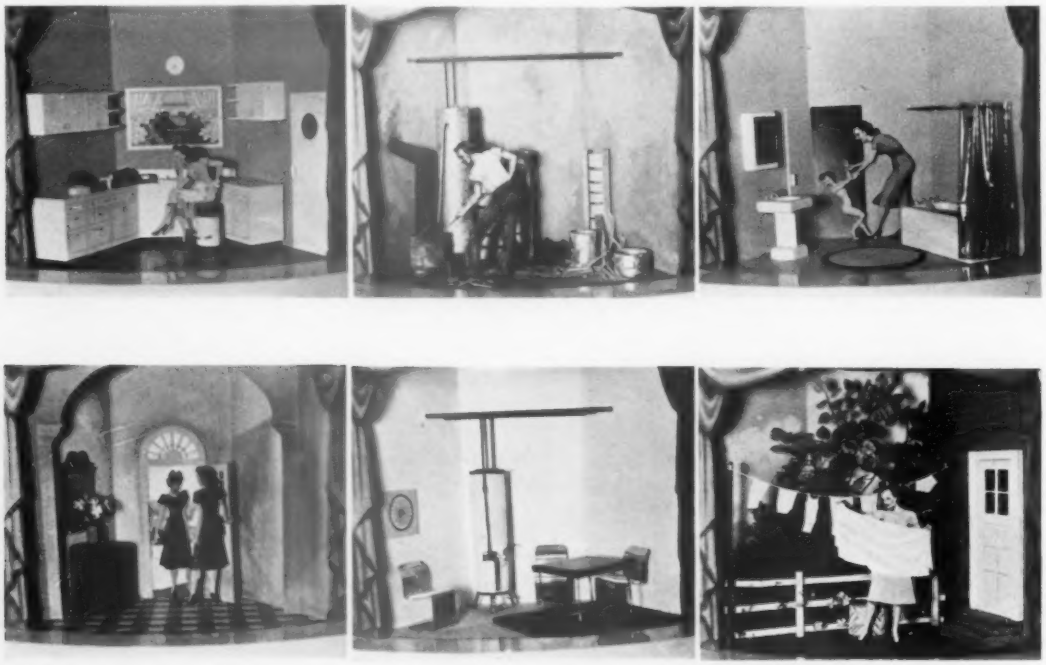
THE newly renovated sales floor of this Company at Broad and Arch Streets, is attracting a great deal of attention from visitors. This most widely used of the company's sales floors has been completely redecorated. The walls have been refinished in new and attractive colors and the display window screens now harmonize with the general decorative scheme. The all-gas kitchen has been remodeled to present the latest in kitchen design.

Refrigeration

At the west end of the floor, to the left of the customers as they approach the receivers' desk, is the refrigerator display. A large mural showing a housewife against a background of symbols of modern civilization tops a display of gas refrigerators. In the center of the display, at eye level, is a circular screen on which is projected a series of 21 messages concerning gas refrigeration.

Water Heating

Against the south wall is the permanent water heater display which is topped by three murals depicting life in old Philadelphia. Against the wall beneath these, stands a setting for the display of water heaters. Included in the setting are a flashing display screen on which messages appear, and two "magic" mirrors. As



The six scenes from the "Little Theatre" on the sales floor.

L. C. Heiss and T. J. Taylor examine the revolving stage.

The Permanent Water Heater Display.

they are approached, these mirrors flash water heater messages.

Directly opposite, and facing the permanent water heater display, is the "Thrifty" water heater exhibit. This shows two "Thrifty" water heater installations.

Revolving Stage

Between the installations is a sound box supporting a revolving stage which shows, in miniature, six scenes in a typical home. These appear in rotation as the stage revolves, and an interesting story of the advantages of a "Thrifty" water heater is told in synchronization as the scenes appear. This display attracts so much attention that there are times when the crowd is too large for all to see. As the complete story takes but four minutes to tell, with an interval of two minutes between presentations, those who miss it have not long to wait for the next time around.

The entire floor display has been planned to secure the maximum benefit and to display gas appliances to the fullest advantage. In conjunction with the display windows, it makes one of the most attractive sales floors to be seen anywhere.

The design and installation of these exhibits is the work of T. J. Taylor and L. C. Heiss.

U.G.I. Circle, August 1939

The "Thrifty" Water Heater Display.

Carrier Introduces New Low Cost Gas Unit

The $5,000 to $8,000 house was hailed by J. I. Lyle, president of Carrier Corporation, Syracuse, N. Y., at his company's "unveiling" on August 7th of a new, low cost air conditioner as the "leading home market of the air conditioning industry."

Mr. Lyle spoke to 200 Carrier dealers, distributors and executives at a meeting at the Hotel Lexington to introduce the new Carrier developments in air conditioning and automatic heating for homes. The meeting marked the company's entry for the first time into the low cost home market.

"Ninety per cent of the new houses in this price class are being air conditioned today," Mr. Lyle said, "and when you consider the FHA figures show 49 per cent of all new construction is in this classification, you can see what tremendous market and opportunity this is for the air conditioning industry."

Mr. Lyle said the introduction of the new Carrier unit was not only a "milestone" for the company, but also for the entire building industry.

"This is the first low cost home air conditioner ever produced by a company devoted entirely to the air conditioning science," he said. "It took us 12 years to develop this air conditioner, not counting years of experimentation in other lines of air conditioning before 1927."

The new unit was introduced by E. T. Murphy, vice president in charge of marketing, who noted that it will sell for 400 per cent less than the first Carrier home air conditioner introduced in 1927. Prices for the new unit range from $295 to approximately $500, depending on installation work and ducts required, while the 1927 model cost $2,500.

Features, other than low price, of the new unit are the reduced size and compactness. Occupying less than five square feet of floor space, it will fit in an average size closet and is styled to be located within sight on the first floor or in a basement game room.

"This is a move on our part to take the furnace out of the cellar," Mr. Murphy explained.

The air conditioner, known as the home Weathermaker, is available for gas fuel and it can be used with existing warm air furnace ducts as well as in new low cost homes. The unit is completely factory assembled and can be installed in a few hours. A matched unit for summer cooling may be included as a part of the system either at the time of installation or later.

Other home line equipment introduced included two direct fired air conditioners, one for the $8,000 to $15,000 home and one for the $15,000 to $20,000 home; a dual system air conditioning system that provides air conditioning for selected rooms and automatic heat to service rooms; a gas, oil and stoker fired furnace for automatic heating; an oil burner; an automatic bituminous stoker and a model for anthracite; a room ventilator and an automatic water heater utilizing oil.

New Equipment

Mercury Pressure Gauge

Connelly Iron Sponge & Governor Company, 3154 S. California Avenue, Chicago, has introduced a new Mercury Pressure Gauge, which is said to incorporate a number of improvements that make for convenience and durability.

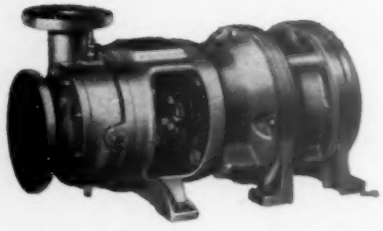
The body of the gauge is of cast semi-steel. For the tube, an unbreakable glass substitute is used, threaded directly into the casting. This feature is said to eliminate glands or packing.

Wide-angle visibility is provided for reading on the black-etched aluminum scale which is graduated from 0 to 3½ pounds on one side and 0 to 56 ounces on the other.

Connelly has issued bulletin No. 401-B2 fully describing this gauge, a copy of which will be sent on request.

General Service Motorpump

A new illustrated broadside showing construction details of the Ingersoll-Rand Motorpump has just been published by the manufacturer.



The I-R Motorpump, built in sizes for delivery of from 5 to 1000 g.p.m. and heads up to 500 feet.

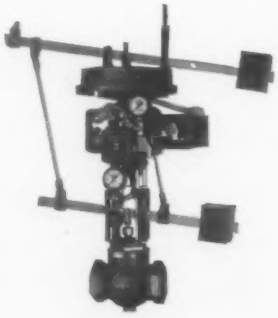
This pump, which is designed for all types of general service, is built in sizes for delivery of from 5 to 1000 gallons per minute and heads up to 500 feet. It embodies a unit construction with the pump impeller mounted directly on the shaft of the electric-motor drive. The entire unit is enclosed in a housing which requires no baseplate or foundation and may be bolted down for operation in any position.

Copies of the folder, Form 1917, are available from the Ingersoll-Rand Company, 11 Broadway, New York City, or any of their branch offices.

New Combustion Regulator

The Type VO80A Combustion Regulator is designed to hold the steam pressure in a gas fired boiler within close limits, and to control the air supply to the burner in conjunction with the gas resulting in high combustion efficiencies.

This regulator can be installed to automatically fire any radiant or blue flame burner of the atmospheric type.



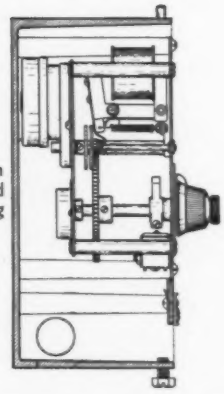
Installation is very simple as the entire control is mounted on the gas valve bonnet at a single point. A ¼" steam supply and exhaust line and connection to the electric service complete the installation.

High pressure safety is one of the functions of the regulator. The convenient terminal panel, however, is arranged for easy incorporation of additional safety devices such as a Lo-Water cutoff, a Pilotstat or a Protectoglo flame safeguard relay. Any interruption of the electrical safety circuit by one of the above devices will cause complete safety shutdown of the gas valve regardless of the demand on the regulator due to low steam pressure.

Made by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Partlow Time Delay Relay

The Model 308 Time Delay Relay is used for automatically timing the duration of a process cycle. It comprises a synchronous timing motor driving a gear train through a magnetically engaged clutch. At the end of the timing period, a switch operates to stop the timing motor and either connects or disconnects the load as desired. Upon breaking the timer circuit the magnetic clutch releases and the timer automatically resets itself. The timing is easily adjusted by setting the knob and pointer to the desired time on the calibrated scale. As the timing period elapses, the pointer travels over the scale and indicates the amount of the timing period remaining.



Front view with cover removed and diagram showing detail.

It is supplied entirely enclosed in an attractive black ripple finish aluminum case with glass window or open-faced cover for observation of the dial. Four knockouts are provided for convenient wiring.

Three timing ranges are available in all Models: 0 to 5 min., 0 to 50 min., or 0 to 5 hours.

Fully described in Bulletin 770 of The Partlow Corporation, New Hartford, New York.

and Appliances

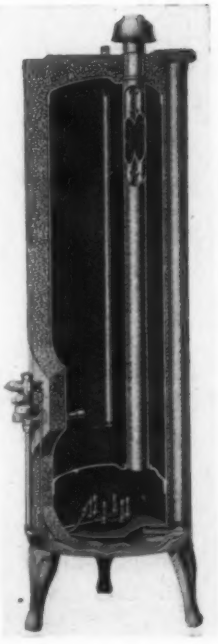
1939 Crane Water Heater

The introduction of a new principle of air control is featured in the 1939 Crane gas water heater.

Air needed for combustion, both primary and secondary, is taken in at the top of the heater instead of at the bottom. When the burner is off an air lock is created. Cold air is locked out and heat loss minimized. The entire base of the heater is closed tight.

Other features introduced in the new Crane water heater are: A 5-in-1 thermostat which includes gas filter; built-in gas flow adjustment; main shut-off valve; safety push-button control, new electro-magnetic complete gas shutoff, which shuts off the entire gas supply if the pilot should be extinguished; a heavily insulated, plug-type combustion chamber door that protects the exterior finish against discoloration; 2½" of Heatseal insulation as previously supplied is continued as standard in this unit.

New cabinet models, a table-top unit, and improvements in Crane Keystone and Champion Gas Water Heaters are among other features of the complete 1939 Crane line which meet the new, more rigid requirements of the American Gas Association Testing Laboratory. Catalog through Premier Heater Division, LaPorte, Indiana.



Crane Water Heater

Portable Mercury Pressure Gauge

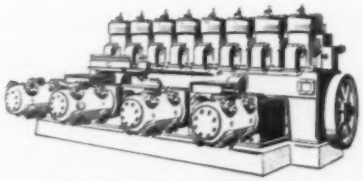
To meet the requirements of natural gas companies, The Meriam Company of Cleveland, Ohio, has recently produced a portable Mercury Pressure Gauge for field use. This gauge is used to check and measure gas pressures on large mains and is easily carried from one pipe line to another.

Of well type, single tube construction, the gauge reads directly in pounds and tenths of pounds. To assure light weight with strength, the channel body is formed of aluminum. For maximum durability under rough field service, an unbreakable, clear "Pyralin" tube is gland packed in the channel directly above the aluminum scale. Sturdy legs hold the instrument in an upright position; an adjustment unit enables the operator to quickly set scale to zero.

The Meriam Portable Mercury Pressure Gauge is built in scale ranges to meet individual requirements. Although on the market only a short time, this gauge, according to the manufacturer, is already bringing in repeat orders.

8 Cylinder "Angle" Compressor

Clark Bros. Company, of Olean, New York, have announced that their right-angle compressor, built heretofore in 2, 3, 4, 5, and 6-cylinder sizes, is offered also in an 8-cylinder, 800 H.P. size. This larger size is made to meet a demand of the larger natural gas companies which have found the "Angle" type of compressor especially satisfactory for booster station service. The



Right Angle Compressor

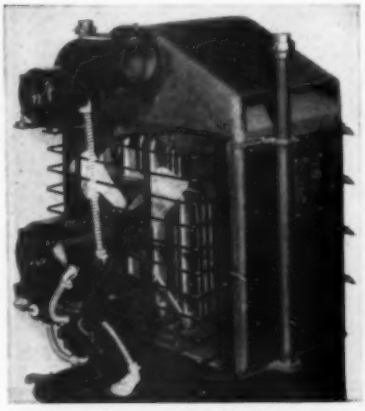
8-cylinder size, however, will be suitable for many types of service. Two of the 8-cylinder "Angles" have been built for a Texas refinery. With the new 8-cylinder angle it will be possible to install a 3,200 H.P. Gas Booster Station in a floor space 24 x 105 feet.

Gas Fired Unit Heater

The Automatic Gas-Steam Radiator Co., 497 Brushton Ave., Pittsburgh, Pa. announces a new series of five gas-fired unit heaters, ranging in capacities from 85,000 to 200,000 B.t.u. per hour, which are equipped with automatic flues for venting products of combustion from interior of building. These heaters employ natural or manufactured gas for fuel and are applicable for many types of buildings such as stores, garages, churches, schools and manufacturing plants of all kinds.

The automatic flue consists of a motor and blower connected in such a way that when the heater starts to work, the flue automatically carries the products of combustion through pipe and wall to the outside. The assembly includes a safety pilot which turns off the gas as the pilot goes out or burns too low to insure ignition. In addition to heating, these unit heaters may be used for other purposes such as ventilating, cooling and drying.

Their operation and construction is quite simple. The unit is suspended from the ceiling, out of the

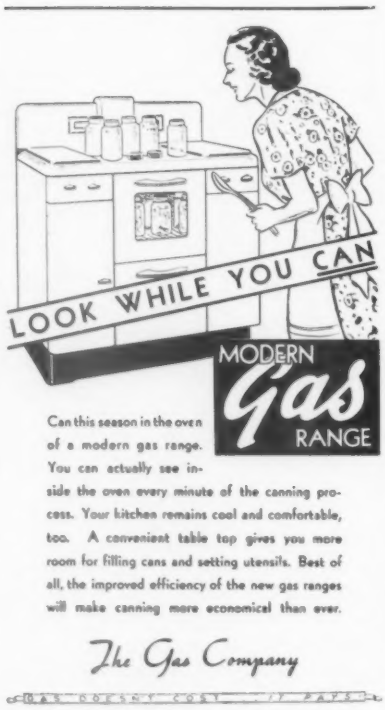


Gas Fired Unit Heater

way. The gas fires into a combustion chamber and the products of combustion pass upward into a bank of tubes, and then are automatically carried outside. Air is passed around these tubes by means of a motor-driven fan located on the back of the unit.

The manufacturer will gladly forward complete information, literature and prices upon request.

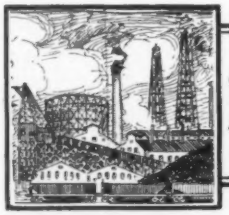
I HAD NO IDEA GAS HEAT WOULD COST US SO LITTLE!
YES—AND ITS GREAT CONVENIENCE IS WORTH SO MUCH MORE THAN IT COSTS
AKE A TIP FROM NEW HOME OWNERS . . .
More new home owners are selecting gas heat today than ever before — particularly small home owners. And, their first winter with gas heat has convinced these families that the most modern of all heating methods is within their budget. Why not get a FREE heating survey made of your home now. You, too, will discover that you can afford to be modern with gas heat.
You Can Afford to be Modern with GAS HEAT
The Gas Company
GAS DOESN'T COST—IT PAYS


LOOK WHILE YOU CAN
MODERN Gas RANGE
Can this season in the oven of a modern gas range. You can actually see inside the oven every minute of the canning process. Your kitchen remains cool and comfortable, too. A convenient table top gives you more room for filling cans and setting utensils. Best of all, the improved efficiency of the new gas ranges will make canning more economical than ever.
The Gas Company
GAS DOESN'T COST—IT PAYS

JUST A MINUTE-
READ THIS BEFORE ORDERING FUEL FOR THIS WINTER
Have you been skeptical about the cost of gas heat? Perhaps you've guessed it to be "too rich for your blood." Why not get the true facts of gas heat for your home in this FREE heating survey? Phone The Gas Company for it today. No obligation in the least.
FREE HEATING SURVEY
This heating survey includes a complete analysis of your present heating costs and a reliable estimate of the cost of gas heat for your home. Complete service is FREE. Phone her it now.
You Can Afford to be Modern with GAS HEAT
The Gas Company
GAS DOESN'T COST—IT PAYS

Here are three examples of effective newspaper advertisements used by Ohio Fuel Gas Co. of Columbus in two column and three column widths. Left and right offer two good angles of approach on house heating. Some details of the modern gas range and its convenience in home canning are well expressed in the center advertisement. The brevity and directness of text matter in all three insures attention.

WATER HEATING SERVICE FREE!!
The REPUBLIC HEET-RE-TREEVER
will save
45,000 CUBIC FEET
of manufactured gas on any home-heating installation of average size
This is more than enough gas to supply automatic water heating for the entire year.
Use the Republic Burner, Heet-Re-Treever and Water Heater Package to offer your customers
Two Major Services at the Price of One
AUTOGAS CORPORATION
2258 Diversey Avenue *Chicago, Ill.*
General Sales Agent, Republic Heaters Sales Co., Chicago



News of the Gas Industry

Gas Meters Association of Florida and South Georgia

This organization, made up of manufactured gas companies in Florida and South Georgia, meets once each year in a general session for the exchange of ideas and reading of papers on manufacturing, distribution, and sales problems. In addition to this meeting each September a Sales Training Conference is held for the Gas Company Salesmen of the various utilities in the state. Such a program was completed and arranged for at a Directors' meeting which was held in Winter Haven on August 20th.

The officers and directors are as follows: A. H. Bruning, Commercial Manager of the Florida Public Service Company in Orlando, President; J. W. Owen, Manager of the Central Florida Gas Company in Winter Haven, Vice-President; W. H. Duguid, Sales Manager of the Jacksonville Gas Company in Jacksonville, Secretary-Treasurer; L. P. Sullivan, Representative of the American Stove Company, Director; C. D. Littlefield, General Manager of the People's Water and Gas Company at Miami Beach, Director; O. F. Keune, Sales Supervisor of the Florida Power and Light Company at Miami, Director; Carleton Van Dervort, Salesman of the People's Water and Gas Company at Miami Beach, Director; G. G. Greer, Sales Manager of Clearwater Gas Department, Director; Mr. Pierce, Key West Gas Company, Director.

The Directors met August 18, in Winter Haven where routine matters of the organization were discussed and definite plans completed for the one day sales conference scheduled for September 22. This one day sales conference will be an instructive Sales Training School for gas company salesmen, and the program will include promotional talks as well as sales presentations on Gas Ranges, Automatic Water Heaters, Space Heating and Electrolux. An all day cooking demonstration will be conducted for Commercial Gas Salesmen to demonstrate fully the value of the modern hotel and restaurant equipment.

The headquarters for the one day sales conference will be the Haven Hotel in Winter Haven. Special attractive rates will make possible an attendance of approximately 150 gas salesmen from over the state.

A.G.A.E.M. Reports Healthy Increase in Appliance Sales

Gas appliance sales throughout the United States increased sharply during the first six months of this year as compared to sales figures for the corresponding months in 1938, it was reported by the Association of Gas Appliance and Equipment Manufacturers from their national headquarters, 60 East 42nd Street, New York.

Sales of gas-fired furnaces (house heating equipment) registered an increase of 101.0 per cent for the first six months of 1939 over sales of the same months in 1938.

Gas range sales for the first six months of 1939 increased 38.4 per cent over the corresponding period of last year.

Sales of gas refrigerators for the first six months of 1939 were 30.0 per cent ahead of sales during the same months in 1938.

The gas water heater industry reports an increase of 28.1 per cent in the sales of automatic gas-fired water heaters during this six-months period as compared to sales during corresponding months in 1938.

Sales of gas-fired boilers registered a rise of 5.6 per cent for the first six months of 1939 as compared to the same period in 1938.

CONVENTION CALENDAR

September

6-9 *Pacific Coast Gas Assn.* 46th Annual Convention Fairmont Hotel, San Francisco.

9 *Gas Industry Day,*—Golden Gate Exposition.

October

9 *Gas Industry Day,* — New York World's Fair.

9-12 *American Gas Assn.* Annual Convention, New York, N. Y.

19-20 *Empire State Gas & Electric Assn.* Annual Convention, Westchester Country Club, Westchester, N. Y.

23-28 *National Metal Congress and Exposition.* Exhibit sponsored by A.G.A. Industrial Gas Section included.

26 *Midwest Industrial Gas Sales Council, Palmer House,* Chicago.

30-31 *Amer. Society of Heating and Vent'g Engineers,* Fall Meeting, Atlanta, Ga.

Gas Division, Oklahoma Utilities Assn.

A meeting of this Division is to be held at Biltmore Hotel, Oklahoma City on September 14th. Indications point to a good attendance of gas men.

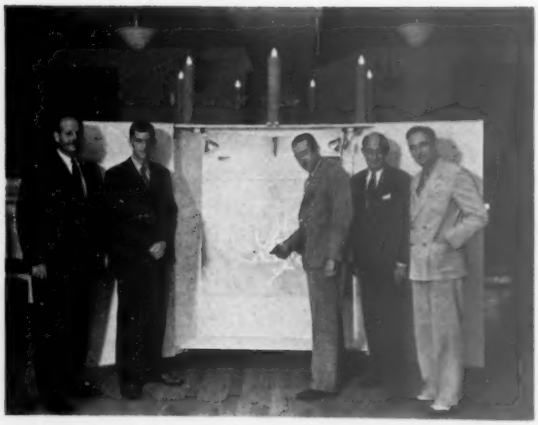
The tentative program includes the following with W. L. Woodward, President of Zenith Gas System Inc., Alva, Oklahoma presiding:

"Duties of a District Manager," L. D. Black, Lone Star Gas Company, Ennis, Texas; "Dealer Aids in Promoting Gas Sales," F. M. Rosenkrans, Gas Service Company, Kansas City, Missouri; "Application of Temperature and Velocity Boosters," E. C. McAninch, Chemist, Oklahoma Natural Gas Company, Tulsa, Oklahoma; "High Bill Complaints," Carl Dean, Oklahoma Natural Gas Company; "Servicing Appliances," E. A. Bartolina, Consolidated Gas Utilities Corporation, Blackwell; "Air-Conditioning," Don Mayne, Air-Conditioning Division, Williams Oil-O-Matic Heating Corporation, Bloomington, Illinois.

A.G.A. Analysis of Gas *At Work* in the World Fair

To help in building non-residential gas loads and equipment sales, the Publicity Committee, Industrial Gas Section, American Gas Association, has just produced for general use by all members of the Association an attractive 8-page, 2-color, statistical analysis of the role played by gas in the operation of the New York World's Fair. The piece gives a complete tabulation of "who uses gas for what," detailing every use of gas by 211 World's Fair exhibitors, concessionaires, and operating units. It also provides a complete breakdown-by-type of the 3,249 separate pieces of gas-fired equipment at work on the Fair Grounds in no less than 437 locations representing 87.2% of all the buildings in the area.

Inside, under the headings: Gas heats the water for cleanliness and public health; gas beautifies with light and flame; gas cooks for over 5½ million fairgoers per month; gas—versatile worker at processing and manufacture; gas refrigerates—preserves food; and gas air conditions—stands watch against weather; the publication shows, solely on the basis of statistics, that gas at the New York World's Fair is busy doing practically all of the restaurant cooking, dish sterilization, baking, space heating, steam generation, general water heating, refreshment preparation, heat processing, and food manufacturing; and amazing amounts of commercial refrigeration, display lighting, air conditioning, and special jobs.



Left to right, Stuart M. Crocker, manager of the G-E air conditioning and commercial refrigeration department; Harold Hulett, distribution sales manager; S. M. Vance, newly appointed manager of gas equipment sales; Elliott Harrington, product sales manager; and A. E. Pierce, manager of the heating sales section.

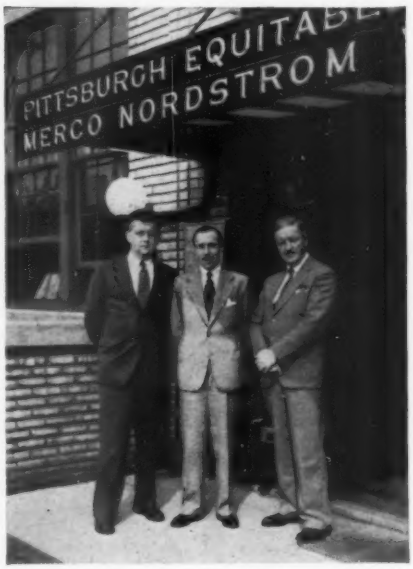
G-E Sales Heads Emphasize Swing to Gas Heat

Marked increases in natural gas availability and in the popularity of warm air heating installations fired by both natural and manufactured gas were emphasized recently in key city distributor meetings held by the General Electric air conditioning and commercial refrigeration department, on the occasion of G-E's observance of its seventh birthday in the heating business. A feature of the meetings was the birthday cake, shown herewith. One segment of the "cake" opened up to show territories in which gas-fired warm air conditioning will be promoted vigorously.

Pittsburgh Equitable Establishes European Agency

Colonel W. F. Rockwell, President of Pittsburgh Equitable Meter Company, Pittsburgh, has announced the appointment of the Anthony Bruyaux Company, Brussels, Belgium, to be sales agents for Pittsburgh Equitable products in Belgium, Holland and France.

This company already handles the sale of valves for the Merco Nordstrom Valve Company, a Pittsburgh Equitable subsidiary. Mr. Bruyaux, head of the firm, is well known throughout industrial Europe, and stated that in addition to his present staff, a new and larger organization will be created to serve the industries interested in the complete line of Pittsburgh Equitable products.



The accompanying picture, taken at the main offices of Pittsburgh Equitable Meter Co. and Merco Nordstrom Valve Co., Pittsburgh, shows (left to right) Mr. George Doty, Export Manager; Mr. Anthony Bruyaux; President W. F. Rockwell.

All sizes up to 3,400 cu. ft. capacity

Meters
Diaphragms
Repairs
Provers
Pumps
Calorimeters
Wet Meters
Gauges
Apparatus

METER REPAIR PARTS

FOR

ALL MAKES — ALL SIZES OF METERS

LARGEST GAS COMPANIES NOW USING OUR PARTS

SEND FOR OUR CIRCULAR ON METER REPAIR PARTS

SAMPLES AND PRICES GLADLY SENT

— 0 —

LAMBERT METER CO.

PLAINFIELD, NEW JERSEY

TITAN WATER HEATER CONTROLS

AGA Approved TITAN Temperature and Pressure Relief Valve

This device is installed on the hot water outlet in the tank directly in the flow of water. Action, as a result, is unfailing and positive, there being no dead pockets to prevent proper functioning of relief valve.

Pressure relief is obtained through a spring-loaded valve which opens when the pressure reaches a predetermined point. Should the water become overheated to 200° F, a fusible disc melts and lets the water escape thereby preventing a further increase in temperature.

The Titan Relief Valve serves as a coupling connected in the line thereby eliminating the necessity and expense of a tee fitting. To replace fusible disc, it is not necessary to disassemble valves or piping in any way.

Design for application to storage or range boilers. Prevents corrosion, scalding and explosion.

Catalog and full information upon request.

The Titan Valve & Manufacturing Company

Thermostats • Safety Pilots • Relief Valves • Safetystats
9913 Elk Avenue Cleveland, Ohio

Energy Distributed by Gas and Electric Industries Compared

Few people realize the importance of the gas industry in the domestic and industrial life of the nation through the distribution of energy in the form of manufactured and natural gas.

The energy distributed by the gas industry in the United States is greatly in excess of the energy distributed by the electric industry based upon converting the MCF and Kwhr figures into British Thermal Units.

During 1938 the energy sold in the form of gas amounted to approximately 1380 trillion BTU or over three times the total electric sales of 420 trillion BTU.

Much publicity has been given to the energy available from the TVA hydro-electric power development, where the present installed capacity is 420,000 kw and the ultimate installed capacity is estimated at 1,400,000 kw. The estimated marketable energy available from this ultimate development is approximately 26 trillion BTU annually, which is only 1/9th of the energy marketed by one of the larger natural gas systems of the country.

Over 50 per cent of the total gas send-out in 1938 was for industrial purposes, which is not competitive with electricity, such as boiler fuel, cement and lime kilns, oil refineries, etc.

Assuming relative efficiencies in the utilization of energy for household purposes in the ratio of two or three to one in favor of electric energy, still leaves a very wide margin in favor of the gas industry in the amount of energy utilized as compared to the electric industry.

Gas Utility Revenues Show Marked Increase in First Six Months

Domestic customers served by manufactured and natural gas utilities totaled 16,154,100 on June 30, an increase of 317,400 over the number reported on the same date a year ago, it was announced today by Paul Ryan, Chief Statistician of the American Gas Association.

Revenues of manufactured and natural gas utilities aggregated $444,541,100 for the first six months of 1939. This was an increase of 5.8 per cent from the corresponding period of 1938.

Revenues from industrial and commercial users increased 8.3 per cent, while revenues from domestic customers gained 4.7 per cent.

Manufactured gas industry revenues totaled $190,849,000 for the first six months, an increase of 2.6 per cent from a year ago. Revenues from industrial users of manufactured gas increased 10.9 per cent, while commercial revenues gained 1.5 per cent. Revenues from domestic uses, such as cooking, water heating, refrigeration, etc., were substantially unchanged from the corresponding period of 1938.

Revenues of the natural gas industry for the first six months amounted to $253,692,100, a gain of 8.3 per cent from a year ago. Revenues from industrial uses increased 11.2 per cent, while revenues from domestic uses increased 7.3 per cent.

The quantity of natural gas used in generating electric power during the six months ending June 30, amounted to 87,002,000,000 cu. ft. This represented an increase of 15.8 per cent from the corresponding period of 1938.

Northern Natural Gas Company Building 16 inch Pipeline

240 Miles to be Constructed

Officials of the Northern Natural Gas Company of Omaha announced recently the completion of a program of refinancing, which involves the issuance of $16,000,000 of 3¼% First Mortgage and First Lien Bonds, and $6,000,000 of Unsecured Promissory notes.

Proceeds of the bond issue will be used to retire the company's outstanding bonds. Proceeds from the notes will be utilized largely in the construction of a new 240 mile, 16 inch pipeline extending from near Sioux City, Iowa, to a point near Minneapolis, Minnesota. The new pipeline will provide substantial additional capacity for the Minneapolis area, and will make natural gas available to a large number of communities in Northwestern Iowa and Southern Minnesota, which have not heretofore had the advantages of natural gas service.

Work on the construction of the line will start immediately, to be completed by November. It is planned to put the new pipeline into operation before winter. The Peoples Natural Gas Company, a subsidiary company of the Northern Natural Gas Company, as well as other gas distributing companies, has been granted franchises for the distribution of natural gas in many communities along the new line.

The construction of the pipeline includes the installation of compressor stations, lateral pipe lines, and distribution systems needed to supply towns not now receiving natural gas service.

The company's pipeline will pass through 95 counties, extending from Texas, through Oklahoma, Kansas, Nebraska and Iowa, into Minnesota and South Dakota.

The Northern Natural Gas Company, one of the largest gas systems in the middle west, obtains its gas supply from the Texas Panhandle and the Otis and Hugoton fields of Kansas, and at present supplies approximately 158 towns in Nebraska, Iowa, Minnesota and South Dakota. The headquarters of the company is in the Aquila Court Building, Omaha.

Contracts for construction of the new line from Sioux City to Minneapolis have been let to two construction firms, C. S. Foreman Company of Kansas City, Mo., and The Truman-Smith Construction Company of Eldorado, Kansas. The two contractors will each maintain two crews on the construction, working simultaneously on four separate sections in order to complete the line at the earliest practicable date.

Financing Gas Appliances

The Electric Home and Farm Authority announced July 22 the first contracts under the recent arrangement with the American Gas Association for cooperation in financing the sale of gas appliances for use by consumers located on the distribution mains. These contracts are with the Board of Water, Electric, Gas and Power Commissioners of the City of Austin, Minnesota, and the Elkhorn Valley Power Company, Scribner, Nebraska.

On July 28, the Electric Home and Farm Authority announced the names of manufacturers of two gas ranges, three gas water heaters, and seven furnace and conversion burners eligible for financing through the Authority by approved dealers.

Announcement is made by Peoples Gas Light and Coke Company of an extensive campaign already under way to finance retail domestic gas appliance sales for upwards of 150 dealers through the E. H. F. A. plan.

Gas appliances now eligible under the plan include Conversion Burners, Refrigerators, Water Heaters, Ranges, Furnaces and Boilers.

The operation of the plan itself by an authorized dealer is simple. Here is how it works:

1. Customer signs a conditional sales contract (EHFA Form 400).
2. Dealer sends contract to the Gas Company, for credit approval. The dealer retains the down payment.
3. After credit has been approved, the Gas Company remits, to the dealer, the unpaid balance of the contract less the 5% per annum finance charge.
4. The Gas Company receives the monthly installments on the unpaid balance. These installments are billed on the monthly gas bills of the purchaser.

The low cost and long term payment periods of the EHFA plan are so attractive that dealers including plumbing and heating contractors and furniture, hardware and appliance stores are urged to contact the Chicago EHFA headquarters immediately.

Pipe Line Application Reinstated

The Federal Power Commission July 26 granted the request of the General Gas Pipe Line Corporation, of Indianapolis, to reinstate the company's application for authorization to construct a natural gas pipe line from central Kentucky to central Indiana. The Commission set September 7 as the date for a public hearing on the application as reinstated and amended.

The company proposes to construct and maintain a 20-inch natural gas pipe line, approximately 130 miles in length, from the gas fields of Kentucky to central Indiana for the purpose of selling natural gas at wholesale only, to industrials and utilities on its lines at rates varying from 30 to 33 cents per thousand cubic feet. The applicant also proposes to construct approximately 40 miles of 3, 4, 6 and 8-inch gathering lines.

1940 Refrigeration Campaign

"Life Begins at '40 for the Gas Refrigeration Industry," emerged as the keynote and theme slogan for next year's expanded sales and promotional plans of Servel, Inc., which program was discussed at final sessions of national and regional sales executives of the company at the Hotel Roosevelt, New York.

"Because of the large potentialities lying ahead in the gas industry as a whole, and the increased business we are looking forward to in the next decade, it was the consensus at our recent sales sessions that 'Life Begins at '40 for the Gas Refrigeration Industry' was an ideal challenging keynote to stimulate next year's sales efforts," George S. Jones, Jr., of Evansville, Ind., vice-president and general sales manager, stated. "Accordingly we expect to build our sales and promotional campaigns for the next year around this theme which seems so appropriate right now.

"Beginning with 1940 our company is looking forward to a new decade in which gas refrigerator sales, both the household and commercial type, will be even greater than those of the last ten years. In looking forward to this big increase in business, Servel, Inc., is planning its selling and promotional plans on a scale larger than ever before.

"The way in which public acceptance of gas refrigeration has grown in the past ten years is phenomenal, but that success is really only a beginning. In fact, the life of gas refrigeration is only about to begin, which is the reason we have chosen the slogan as our sales keynote for next year."

The 1940 promotional program was presented at the meeting by H. S. Boyle, the company's sales promotion manager.

The household gas-operated refrigerator manufactured by Servel, Inc., was first introduced through members of the gas industry thirteen years ago. It is still largely marketed by the gas utilities, and its success has been continuous throughout the years. Its promotional activities are carried on in collaboration with the American Gas Association Refrigeration Committee which conducts Spring and Summer campaigns in which awards are made to companies and gas appliance salesmen. The 1939 campaign recently ended was the most successful in the history of the company.

On the balcony of the Court of Flame at the World's Fair with background of Trylon and Perisphere. From left to right: George S. Jones, Jr., vice-president and general sales manager; Louis Ruthenburg, president, and George L. Roach, assistant to Mr. Ruthenburg.

Fall Meeting of A.S.H.V.E. in Atlanta

Announcement has been made of the inaugural Fall Meeting of the American Society of Heating and Ventilating Engineers to be held in Atlanta, Ga., on October 30 and 31, 1939, with the Atlanta Chapter of the Society as hosts. It is planned to have three technical sessions, a get-together luncheon, a banquet and dance, and a program of special entertainment for ladies.

Atlanta Chapter members are enthusiastic about the prospect of entertaining the Society and, as this was the first Chapter organized in the South, its members keenly appreciate the responsibility of acting as hosts for the first Fall Meeting.

Agee on CP Range Tour

R. S. Agee, sales promotion manager for the Domestic Gas Range Division of the Association of Gas Appliance and Equipment Manufacturers, left New York for the West Coast where he will coordinate promotional activity in behalf of the CP Gas Range program.

Mr. Agee's tour, to extend until the middle of September, will include Los Angeles, San Francisco, San Diego, Portland, Seattle, and Vancouver in British Columbia.

Meetings of utility company salesmen and retail dealer outlets will be held in cities to be visited by Mr. Agee. He also attended the American Gas Association's Annual Home Service Conference in Los Angeles on August 24th, and the Pacific Coast Gas Association's convention in San Francisco on September 8th.

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(Continued from page 13)

air necessary for combustion with the gas before carrying the mixture to the burners. If the mixture is inert, danger of backfire, etc., is removed. Bureau of Mines Bulletin No. 279, entitled "Limits of Inflammability of Gases and Vapors," gives a great deal on this subject. It is possible to calculate from the gas analysis the limits for any ordinary gas. Our 900 Btu mixed gas has limits of 5% to 18% of gas in air. Less than 5% gas or less than 82% air gives an inert mixture.

In the great majority of heating processes the matter of impurities in the gas does not give concern. Once in a great while, however, it is brought up and must be faced. In manufactured gas the main impurity is sulphur, which is found in the finished gas as hydrogen sulphite, carbon disulphide or complex organic compounds. On combustion these gases give sulphur dioxide, an irritating gas, although generally present in too small an amount to be noticeable. When combined with water, however, it forms sulphurous acid, which attacks and gradually destroys steel flues and the mortar of chimneys. Hydrogen sulphide also attacks copper and brass, and if present in any quantities greater than "a trace," gradually eats away the brass orifices of the burners and any copper tubing in its path. State laws limit the amount of sulphur permissible, the usual limit being 30 grains per 100 cubic feet. Our 900 Btu mixed gas, with its sulphur-free natural gas, contains but 8 grains. This is too little to be of importance in any but one case in a thousand; but to guard against any contingency the industrial engineer should be aware of this feature. (Our competitors oil and coal are worse offenders from this angle than we are by far).

Conclusion

In the foregoing we have made mention of a number of so-called tools found in the kit of the industrial gas engineer. Some are of almost daily use, some infrequently called upon. Like a good mechanic the engineer should have his tools sharp, ready for action, and easily accessible when needed.

Natural Gas in Oklahoma

(Continued from page 28)

dollars a week from the Ohio Oil Company for this oil; and as these checks came in every week, we had to use the greater part of this money to keep the payrolls going on the Oklahoma Natural pipe line.

1907 Panic Strikes

By this method, we kept the work going until the fall of 1907 when the panic struck us. I came to the office one morning just as a message from Denny Hastings arrived, requesting that we send $20,000 to clean up the payrolls, and stating that he was shutting down the work until we could raise more money. I made a survey of our situation and found that all together the company and Mr. Braden had only $2,000 or $3,000 in cash. So I wired Denny that we did not have the money and could not cover the payroll, and to shut down the work, which he did. Several days went along and we kept feeding the gang at our camp, but they became more or less restless and wanted their money. The next day after wiring Hastings to shut down the work, I went to the office of the Spang-Chalfant Company to talk to their Treasurer about renewing a $50,000 note which we had given for this 12" pipe. I had to talk their Treasurer into making a renewal note, adding the interest to the note, and cried on his shoulder after telling him the situation which we were in. While talking with him across his desk, he was signing a big pile of pay checks, which we called script at that time, and which had been in general use around Pittsburgh for two or three weeks. I asked him what he was going to do with those pay checks, and he said he was sending them to their mill for the labor payroll. So I said, "Do you mean to tell me you are going to pay your foreign labor at the mill with those pay checks," and he said —"Certainly, we have paid them for two or three weeks this same way; these checks are used with the merchants around Etna and Sharpsburg, and finally come into our bank, and are charged to a special payroll account, and they are generally used in the district in place of currency."

Cash had become so scarce at that time that no matter how much money a man had on deposit in any bank, they would only allow him $20.00 or $25.00 at a time, and then they would question him as to why he needed that much currency

Fortunately for us, Chas. N. Haskell, who had just been elected the first Governor of Oklahoma under statehood, had declared a week's holiday for all the banks in the State of Oklahoma. In other words, the banks were closed by a special edict from Governor Haskell. Many banks in the East were closing their doors, and this same week the Knickerbocker Trust Co. in New York closed, which added fuel to the money panic.

From Spang-Chalfant's office, I went down to the Colonial Trust Co., to see J. C. Chaplin, who was then its active Vice President. I told him our troubles, and asked for a $20,000 loan in order that we might send these pay checks out to Hastings to pay off our foreign labor. Mr. Chaplin began to argue that they would not take the checks and there was no use trying anything like that, because he couldn't put a $20,000 loan through the bank for anyone at this time, even though they would put up twice that amount in government bonds as collateral. Mr. Chaplin began to explain to me that Senator Flynn had just shut down a mine out West and had sent six month notes, drawing 6% interest, out there to pay off his labor. I asked him what was the use of sending six month notes. The last man who received the notes and brought them in for collection at the end of the six month period would receive all of the interest. It seemed to me their foreign labor would just as readily accept the pay checks as the notes. The argument was that it would give us six months time in which to raise the $20,000.

Part 2, continuing this brief history will appear in the October issue. —Ed.

Davis to Service UCC Combustible Gas Indicators

Service on all UCC Combustible Gas Indicators, manufactured by the Linde Air Products Company, now in use will hereafter be maintained by the Davis Emergency Equipment Company, 55 Van Dam Street, New York, according to an announcement made by F. R. Davis, president of the Davis Company. This service includes supplying renewal parts, making repairs, and furnishing operating instructions for these instruments which are used for detecting inflammable and explosive gas-air mixtures. Mr. Davis also stated that instruments carrying the exclusive, patented features of the UCC Indicators will continue to be available through his company.

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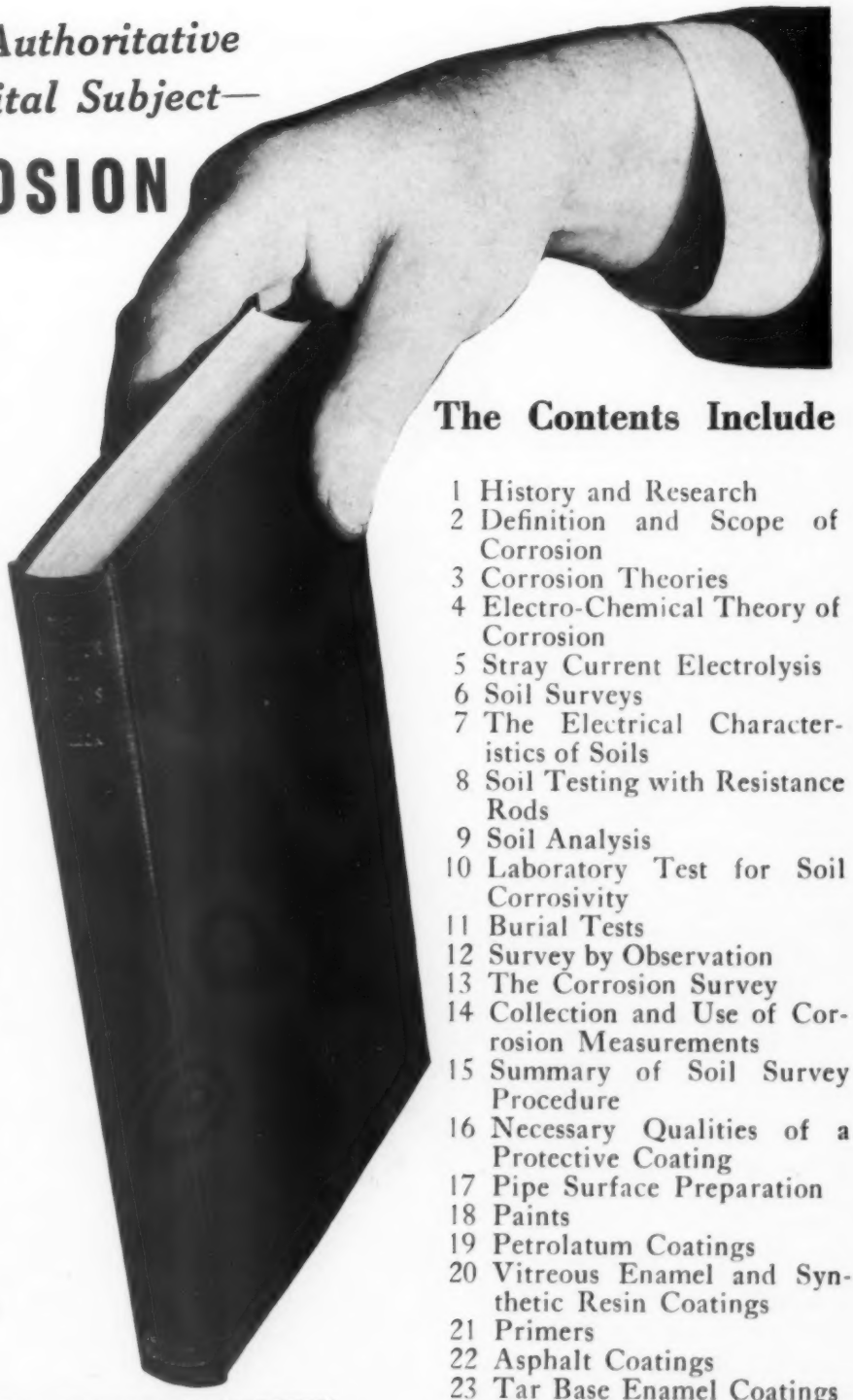

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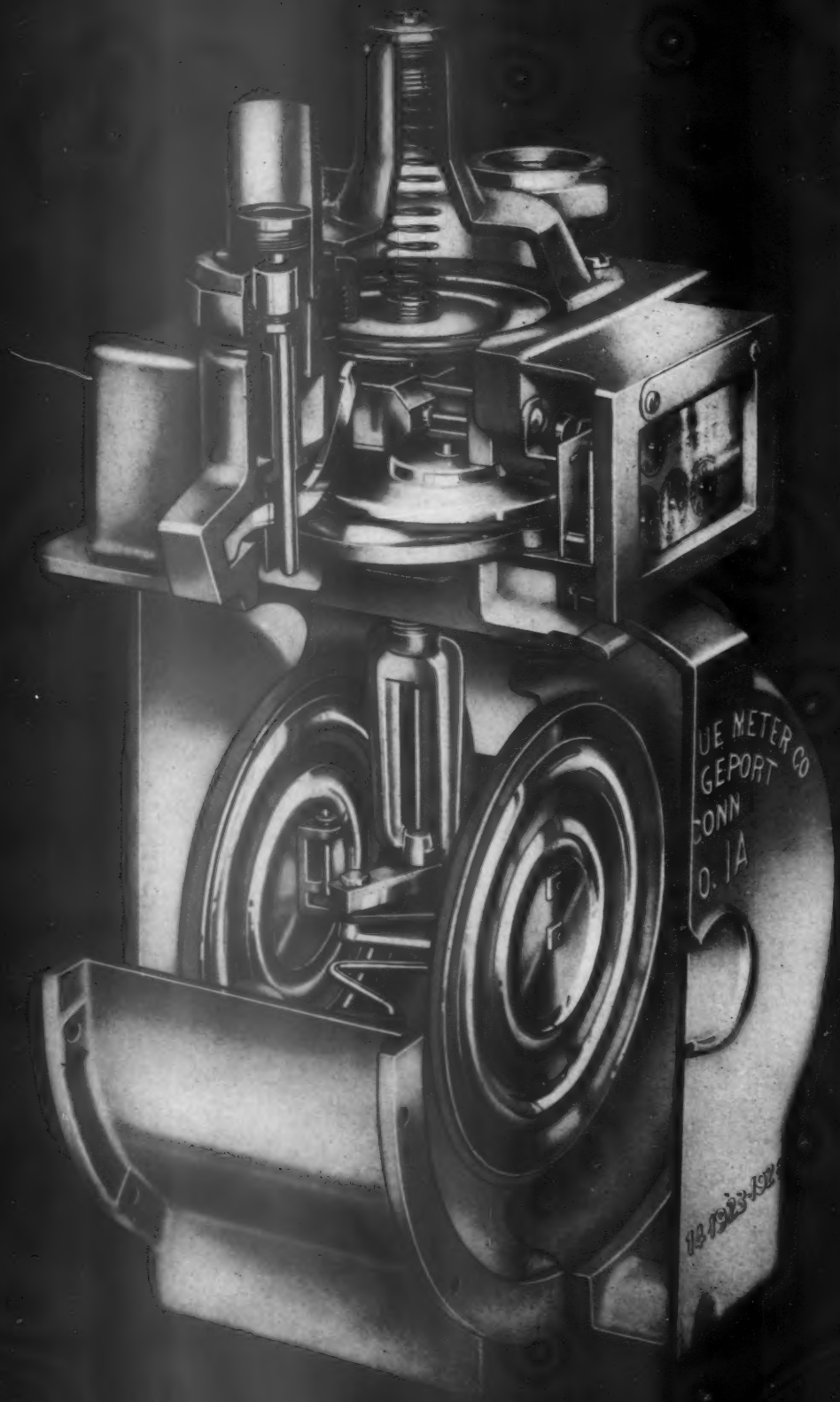

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